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Principal Contents:

	PAGE
High-pressure Boilers	877
The Radiological Congress	879
Shockproof Supply Services. By G. E. Moore	882
Hospital Heating and Cooking. By M. O. F. England	884
Empire Broadcasting	885
Diode Regulators	886
Progress in Electricity Supply	887
Meetings and Discussions	888
Correspondence: The Central Board's Tariff; Rubber and Gutta Percha; The Patent Position; The I.E.E. Regulations; Indeed!	891
New Apparatus and Devices	893
Engineers as Managers? By H. N. Munro	895
Unauthorised Interference. By J. W. Simpson	896
Responsibility for Electrical Accidents	896
In the Courts	897
Business and Industrial Notes	898
Electricity Supply	902
Traction	904
Communications	904
Contract Information	905
Notes	906
Our Personal Column	907
New Companies Registered	908
Returns of Electrical Companies	908
City Notes	909
Stocks and Shares	909
Published Specifications	911
New Work for Contractors	912

High-pressure Boilers

THE attendance last night at the Institution of Electrical Engineers of representatives of several other bodies interested in steam generation indicated how much engineers of different kinds have in common.

The paper on "Post-War Developments in High-pressure Boilers," by Messrs. C. H. Davy and C. H. Sparks, very aptly formed the subject of a joint meeting of the "Electricals," the "Mechanicals," and the Institutes of Fuel and of Marine Engineers. If the metallurgical associations had also been included it would have been quite appropriate, as the ability to take advantage of the economy due to high temperatures owes a considerable debt to progress in the production of alloy steels. Welding and radiography provide further examples of the scientific interests involved, as steel drums welded by metallic-arc fusion can be safely used for high pressures, thanks to the reliability of radiographic examination.

It is fitting that the I.E.E. should have the honour of acting as host to the kindred societies, as it is largely due to the practical experience in the application of thermo-dynamic theories gained in electric power stations that steam generation has made such rapid progress during the past twelve years. A considerable proportion of the reduction in fuel consumption in the period from 3.42 lb. to 1.82 lb. per kWh generated must be attributed to improvements in the boiler house—improvements not only in design but also in operation. Indeed, the increasing regard paid to the qualifications of boiler-house engineers and chemists has been one of the most satisfactory features of power-station control in recent times.

The authors of the I.E.E. paper presented a very thorough survey of technical progress, starting from the pioneer high-pressure station at North Tees, the principles of design of which were later followed up more extensively in America and other countries, where supply over wide areas and high plant load factors were especially favourable to their development.

The most important of the post-war developments have been the extension of the Carnot cycle by the use of high pressures and temperatures, interstage reheating, and bled steam for feed-water heating. To these must be added the immense reduction in floor space for the same output, the coming of pulverised coal with its stimulating effect on stoker and furnace design, and the increasing ability to employ low-grade fuel with economy—all with improved reliability and ease of control.

Excellent results have been achieved at stations in Great Britain without the adoption of many of the refinements advocated to secure the highest thermal efficiency, and certainly "dollar efficiency" is the ultimate criterion. Nevertheless, we believe that an undertaking that is willing to take a little risk in following up new ideas serves a wider public interest, as even if operating savings do no more than balance the additional capital charges, the experience gained is a definite contribution towards the common fund of scientific knowledge, which with modern interconnected stations will ultimately produce individual benefit.

Preventing Radio Interference

THE prevalence of electrical interference with broadcast radio reception is indicated by the fact that the Post Office, in co-operation with the B.B.C., is dealing with cases at the rate of more than 10,000 per annum. Investigation on such a scale must be a formidable task, for in most cases it involves the carrying out of various tests and the subsequent fitting, experimentally, of remedial devices in order to demonstrate to complainants and the owners of offending apparatus that minimisation of the trouble (if not a cure) is possible. The radio industry appreciates the value of this voluntary work to itself as well as to licensed listeners, and the I.M.E.A. has also had the matter under consideration for some time. It is not alleged that the responsibility for eliminating such interference rests wholly with the suppliers of elec-

tricity. The cure is suppression at the source, and it is therefore rather the manufacturers of electrical plant and appliances, and those who install and maintain them, who should be appealed to. Can the I.E.E. do anything to enlist the sympathetic interest of all concerned in solving a difficult problem? The efforts being made by the *Wireless World* to get something done have our full sympathy. Electrical apparatus is now being sold at such a rate as to place the industry under an obligation to the community at large to take practical steps to effectively prevent "man-made" interference with radio reception.

Safety in the Home

A FEW weeks ago we were able to rebut a mis-statement in the lay Press regarding electrical accidents in American homes. We now note that the National "Safety First" Association which operates in this country has quite recently set up a Home Safety Committee in an attempt to reduce the number of accidents—nearly one-half of the total—apart from those occurring in the streets and in factories. The Committee has compiled statistics of the causes of such accidents. No mention is made of electricity; presumably in view of its negligible contribution towards the total it is included in the very small proportion called "miscellaneous." Falls account for most of the fatal accidents—over 40 per cent. of the total. Good lighting should do much towards reducing the figure, and this gives point to our contention that the use of electricity has saved many times more accidents than it has caused. As Miss Haslett is chairman of the Committee, we may be sure that due account will be taken of this aspect.

British X-ray Plant

THOUGH small, the exhibition of apparatus organised in connection with the annual congress of the British Institute of Radiology, incorporated with the Röntgen Society, was fully representative of the British X-ray industry. While no radically new development has been made, the construction of the equipment shows the steadily increasing adoption of engineering principles, and shock-proofing, which the high voltages and greater power now employed make so necessary, has become very complete. Not only is the patient fully protected, but the operator too. Considerable ingenuity is being applied to the devising of methods of controlling dosage and of measuring the effects produced by treatment with a high degree of precision. The complete disappearance of d.c. plant is striking; valve rectification is general, and three-electrode valves are being used more and more for the production of high-frequencies and other medical applications.

India

IT was cheering to hear Sir Thomas Ainscough's optimism at last Tuesday's luncheon of the British Engineers' Association, even though that optimism was qualified in certain respects. He thinks that when conditions improve generally Great Britain's trade with India will rapidly recover, for British manufacturers have an unrivalled reputation for high-class goods and service. An improvement of relations between the people of India and Britain is taking place and as it progresses we may anticipate a larger trade in electrical manufactures with what has long been one of our best, and indeed is now the best, overseas markets. World trade revival as it comes will also help our Indian trade, but some questions that call for settlement will, we hope, be susceptible to treatment under the Ottawa agreements, and then the way will be clearer.

The Consulting Engineer

THE consulting electrical engineer need not despair of the future. The preparation and putting into effect of ambitious schemes, together with the opportunities for acting as expert witness, may not present the same scope as in the past, but there should always be a demand for the unbiased opinion of a technical man known to have high professional qualifications and standards of conduct. Industrial electrification presents an important field in which the varied experience and disinterested attitude of an advisory engineer can be exceedingly valuable to the factory owner. The consulting engineer, acquainted with the most recent products and developments of the industry, can do more than negotiate with tenderers and with the supply undertaking; he can see that the utmost work is taken out of every kWh used. But how will he—in co-operation with his fellow-consultants—educate the factory owner to this view? This is an urgent question that confronts the Association of Consulting Engineers, and its early solution is to be hoped for in the interests both of the consultants and of sound electrical progress.

The Commissioners' Report

THE report of the Electricity Commissioners for 1931-32 confirms statistically what has been generally understood. While the output for the previous year advanced by over 500 million kWh, there was a decline of 37 million kWh sold for power, giving evidence of the compensating effect of the domestic load. Progress in this class has not prevented an overall reduction of more than 100 million kWh in Central Scotland and North-East England. The Commissioners expect the detailed figures for 1931-32 will show a further falling-off in power consumption. If that proves to be the case, the comparison between the output during the first eleven months of this year and the corresponding period in 1931 is nevertheless remarkable. Up to the end of November, the total was 10,958 million kWh, an increase of 768 million kWh, or 7.5 per cent., while for November alone the increase was 12 per cent. There is every need for redoubling our efforts for increasing the domestic load.

A Mine Danger

IN the inquiry into the recent disaster at Garswood Pit, all possible causes of the explosion, whether probable or not, are rightly being investigated. The evidence submitted provides an example of the fallacy of the assumption that a circuit can be tampered with because its normal voltage is low. It was suggested that workmen sometimes cut away the insulation from the signal-bell wires to make local ringing stations. The self-induction of the bell magnet might give rise to an appreciable spark at the point of contact, and, although bells and relays certified by the Mines Department can be obtained from several manufacturers, their safety features can be rendered nugatory by ignorant misuse or negligent maintenance of the connecting wires and bell-pushes. It is to these that attention should be directed by those in responsible positions.

Voltage Standardisation

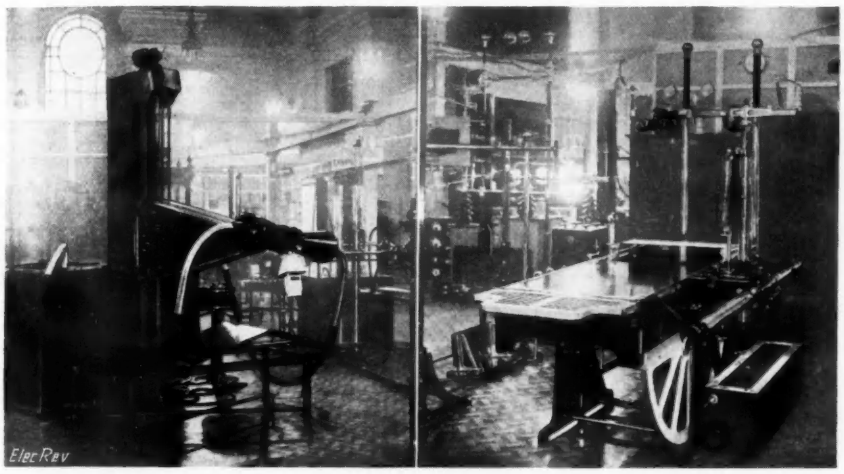
THE standardisation of frequency now being carried out to meet the requirements of the Central Electricity Board's schemes does not take us all the way towards the standardisation that is necessary if we are to buy electrical apparatus at the lowest price. More important still are distribution voltages. Many undertakings are converting or have converted their systems to 400/230-V a.c. operation, but the movement elsewhere is too slow. Those undertakings which are not troubling themselves may be reminded that, under the Act of 1919, the Commissioners may require them to alter the type of current, frequency, or voltage, without any question of compensation. The advantages that would accrue to them as well as to their consumers through reduction in cost of apparatus will eventually go far to offset the expenditure incurred in bringing their systems up to date.

The Radiological Congress. By L. F. Fogarty, M.I.E.E.

A review of the equipment exhibited

THE Congress organised by the British Institute of Radiology and the Röntgen Society under the presidency of Professor F. L. Hopwood, D.Sc., F.Inst.P., was opened on December 7th by Sir George Newman, K.C.B., at the Central Hall, Westminster. In an interesting and stimulating speech Sir George stated that he was convinced, as a result of his long and intimate association with the development of radiology, that neither doctors nor technologists alone could "deliver the goods," but that the maximum service to humanity could only result from the close co-operation of doctors, technologists, and physicists working together as a team.

The exhibition, although a small one, comprising seventeen stands, was fully representative and conveniently arranged. From a careful examination of the apparatus exhibited it is clear that the general tendencies in radiology may be summarised under five headings: The steadily increasing adoption of engineering principles in the design of stands and holders for the modern types of protected X-ray tubes; the incorporation of shock-proof features now so necessary in view of the danger resulting from the greater power and very high voltages employed; the complete disappearance of d.c. apparatus and the almost exclusive adoption of oil-immersed transformers, switchgear, and rectifying valves for the production of the high-voltage power supply; the large amount of skill and ingenuity displayed in devising methods of accurately controlling the dosage and measurement of the radiological effect of the X-ray tubes employed; and the increasing use by radiologists of the three-electrode thermionic valve as a means of producing high-frequency currents for diathermy, as well as in the operation of electro-cardiographs and for a variety of other purposes in the application and measurement of radiation.



Left: A "Solus" tube outfit. Right: A combined couch and screening stand (A. E. Dean)

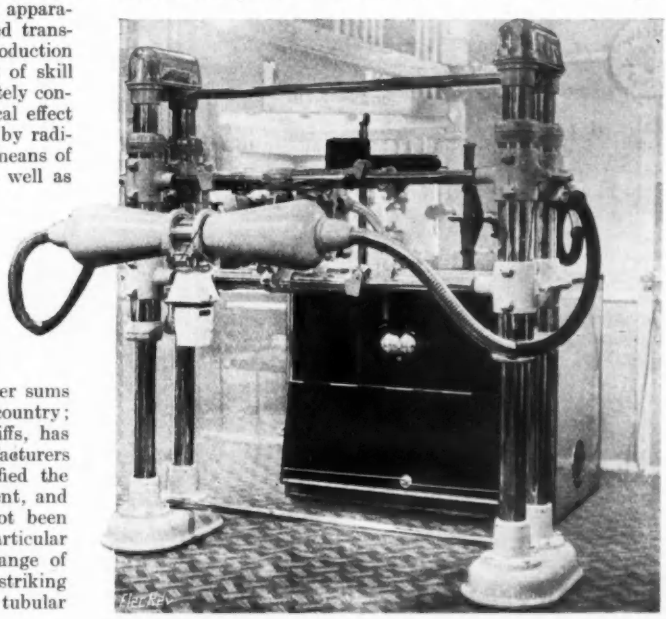
British Manufacturers' Advance

The application of engineering principles to the design of radiological equipment mainly originated in Germany and in America, where, for a variety of reasons, doctors, hospitals, and similar institutions appeared able and willing to expend much larger sums on electro-medical equipment as compared with this country; this fact, together with the existence of foreign tariffs, has hitherto proved a serious handicap to British manufacturers because the favourable conditions abroad have justified the foreigner expending large sums on research, experiment, and development to an extent which up to now has not been possible in this country. It was, therefore, of particular interest to find in the exhibition a very complete range of British-made electro-medical appliances, of which a striking item is the gantry type of tube holder constructed of tubular members and on engineering lines.

Messrs. Watson & Sons' stand, although of extremely solid construction, is so accurately balanced and buffered that the tube may be easily adjusted to any desired position by the mere pressure of the hand. The stand forms part of a complete therapy equipment, incorporating oil-immersed transformers and a tube, giving an output of 4 mA at 200 kV, all comprised within a case measuring 3 ft. by 2 ft. 6 in. by 1 ft. 6 in. high. The illustration of the equipment serves to show the methods now adopted whereby the whole apparatus may be rendered shock-proof.

The Solus Electrical Company also exhibited a cleverly designed stand, in which the vertical motion of the tube is effected by a geared electric motor controlled by a multiple foot pedal, which latter serves not only to adjust the position of the tube but also to apply power to the tube at the appropriate moment. The illustration shows that this particular stand bears a marked similarity to the larger types of radial drilling machine so commonly used in engineering work. The same company exhibited a new design of couch arranged for screen examination, both from above and below the patient, which incorporates several novel features permitting an almost universal range of movement in combination with complete protection against accidental shock.

X-Rays, Ltd., exhibited a very complete range of X-ray stands and couches. The special feature of this exhibit was the avoidance of all unnecessary complications, leading to admirable simplicity of operation. Messrs. Schall & Son, one of the earliest manufacturers of medical apparatus in this country, showed a range of equipment incorporating several novel and useful features, of which special mention may be made of a patented system whereby an ordinary X-ray tube may be employed so as to be completely shock-proof. In view of the relatively high cost of modern X-ray tubes, this feature should be of particular interest to practitioners, since it would enable them to utilise existing equipment with all the advantages of complete protection, both from shock and secondary radiation. A noteworthy feature is the special attention now given to the design of coronaless overhead conductors, enabling the high-voltage power to be transmitted from the generator to the tube, not only safely but also without polluting the atmosphere with the gases produced by a corona discharge. This detail improvement should be of particular interest to all those who have experienced the unpleasant conditions existing in the confined space of an operating theatre or electro-medical treatment room.



Apparatus shown by Watson & Sons (Electro-Medical), Ltd.

Tubes and Protective Devices

Messrs. Cuthbert Andrews displayed a range of their British-made "Protex" tubes, some of which incorporate all the latest shock-proof features. Their exhibit was of particular interest as they are one of the few British manufacturers of modern X-ray tubes. Unfortunately, for the reasons pre-

viously explained, the majority of the tubes so far used are of foreign manufacture, and it is therefore gratifying to see that a serious attempt has been made to produce this essential article in this country in quantities and types suitable for all purposes. This firm also demonstrated examples of its " Protex " lead glass which is now being largely used to replace the foreign product. This is of special composition, which, whilst retaining complete transparency in the ordinary sense, confers protection equivalent to 3.2 mm. of lead for a glass thickness of 11 mm.

Philips Industrial, Ltd., displayed, as usual, a range of their well-known " Metalix " X-ray tubes, which, owing to their valuable features, have in recent times been employed almost to the exclusion of other types, particularly for deep therapy.

The general design of the products of this firm compel admiration because of the extreme attention given to every detail. Their portable sets, in particular, are beautiful examples of ingenuity and compact design. Special mention may be made of their ionognom dosimeter, incorporating a combination of an electrometer, a transformer, and a rectifying valve, which, acting together with an electro-magnetic stop watch, permits an accurate and rapid measurement of the X-ray dosage to be applied to the patient. It is understood that arrangements are being made for the manufacture in this country of an increasing proportion of this firm's products.

A New Electro-cardiograph

The General Radiological & Surgical Apparatus Co. exhibited a comprehensive range of its products, among which the newest, and therefore most interesting, was a new type of electro-cardiograph, designed by Professor Groedel. Hitherto this type of instrument had of necessity been heavy and cumbersome, incorporating extremely sensitive and fragile string and coil galvanometers, so that while it has rendered immense service in hospitals and institutions, difficulties have always been encountered in effecting bedside measurements. The new apparatus overcomes many of the original disadvantages and depends for its operation upon the recently discovered possibility of increasing the primary heart action current and not merely improving the sensitivity of the recording apparatus. The new electro-cardiograph employs the principle of amplifying the heart action voltage by means of thermionic valves to a thousand times its original strength, and it is now possible not only to render the heart beats audible, but to record its action upon a continuous roll of cinematograph film. The apparatus is compact, easily portable, and of very ingenious design; it bears a strong resemblance to the chassis of a modern radio receiver, and serves as an excellent example of the contribution which the products of the radio engineer is making to medicine and surgery.

There was also exhibited a new cadmium lamp of German manufacture, consisting of a silica tube containing a small quantity of cadmium, which, being solid at ordinary temperatures, renders the burner easy to transport. The spectrum of the emitted radiation is rich in the region of the ultra violet and is therefore capable of producing practically all the beneficial effects of sunlight treatment for which mercury-vapour burners have hitherto been used. The lamp emits a pleasant reddish light, but, unlike the mercury burner, it does not produce ozone or fumes when in operation and may therefore be used in many cases where mercury-vapour burners would be impossible. A further advantage lies in the fact that the lamp may be started merely by the closing of a switch and without tilting or excitation of any kind.

Messrs. A. E. Dean & Company, in addition to showing their ordinary range of radiological appliances, exhibited a very ingenious form of combined couch and screening stand. This item possesses several new and cleverly thought-out details, which, giving as they do complete control of both tube and patient, shows the extent to which refinement of mechanical detail is now being applied. The Victor X-ray Corporation, which is associated with the American General Electric Company, exhibited a good array of its products, all of which have been known for several years as possessing excellent features of design.

A General Review

Reviewing the exhibition as a whole, it cannot be said that there have been any startling developments or sensational advances made during the past year, but there is ample evidence of increasing attention to details, improvements in design and method of control, together with the provision of greater safeguards, both for the operator and for the patient. The general tendency is for an all-round adoption of metal-clad or metal-screened power plant and controls in order to permit of effective earthing. Although at one time certain groups of experts felt that the employment of X-ray protection was being overdone, the fact remains that whereas formerly X-ray dermatitis and other kindred maladies were not uncommon amongst radiological workers, it is now comparatively rare for such dangerous and painful afflictions to occur. This would appear to justify all the care and attention which has, and continues to be, devoted to this particular point.

There still appears to be considerable discrepancy in the overall dimensions of transformers of different manufacture alleged to produce the same kVA output. Whilst the majority of manufacturers work to British Standard Specification, it seems doubtful whether this practice is universally adopted, despite the advantages which it would confer upon a prospective purchaser, more particularly as it is hardly likely that a medical man would be able to draw any definite conclusions as to the output and security of a transformer by mere external examination.

The exhibition reflects great credit on the organisers, who deserve thanks from all interested in radiology for bringing together in the form of an exhibition the products of all the leading manufacturers of electro-medical apparatus, and by providing lectures and other entertainments in the same building have made it possible for everyone interested in this branch of science to keep abreast of the times.

Congress Papers and the Annual Dinner

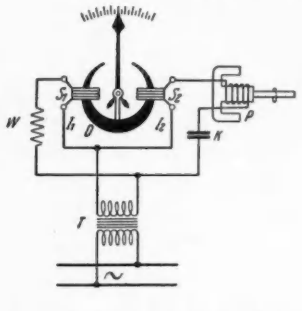
The thirteenth Mackenzie Davidson Memorial Lecture was delivered by Dr. J. Chadwick, who dealt with " The Neutron." Physical and technical papers were contributed by Mr. C. N. Kemp on industrial radiology and by Dr. G. W. C. Kaye on an international comparison of the Röntgen, the unit of quantity of X-rays. Dr. H. Franke (Hamburg) outlined new possibilities in radiographic technique with the " Rotalix " tube and Mr. W. E. Schall described a 500-kV Villard unit.

Six medical papers were read and the fifteenth Silvanus Thompson Memorial Lecture was delivered by Viscount Lee of Fareham on " Radium as a Therapeutic Agent, the case for National Control." The Congress ended with the presidential address of Prof. F. L. Hopwood, who occupied the chair at the annual dinner in the evening.

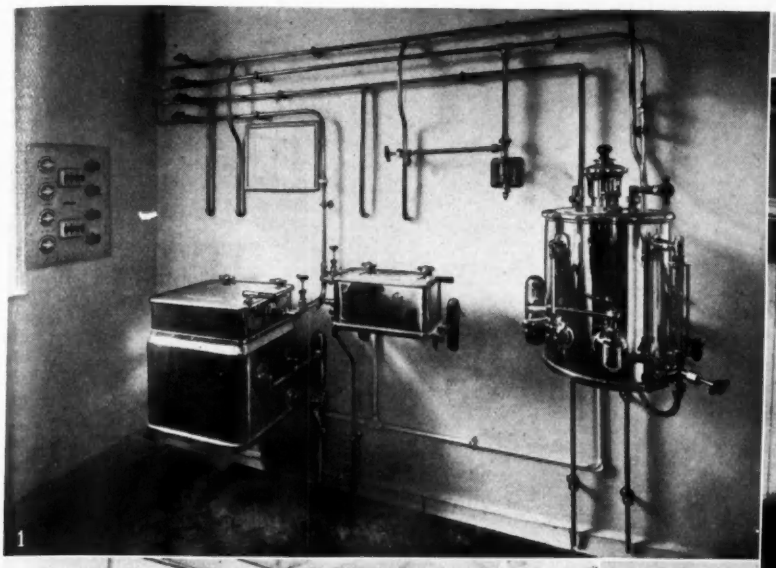
After the loyal toast " The Institute " was proposed by Dr. J. H. D. Webster, who referred to its unique position and stated that in no other country were radiologists so well organised as in England. In his reply Dr. Hopwood spoke of the Institute's past achievements and its educational aims. " The Guests " was proposed by Mr. V. E. Pullin (Woolwich Arsenal), on whose behalf Lord Lee, Sir Holburt J. Waring (President of the Royal College of Surgeons), and Mr. Geoffrey Pearce replied.

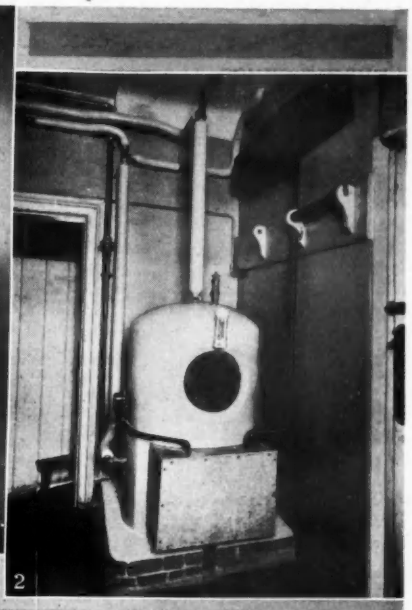
Testing Instrument Coils

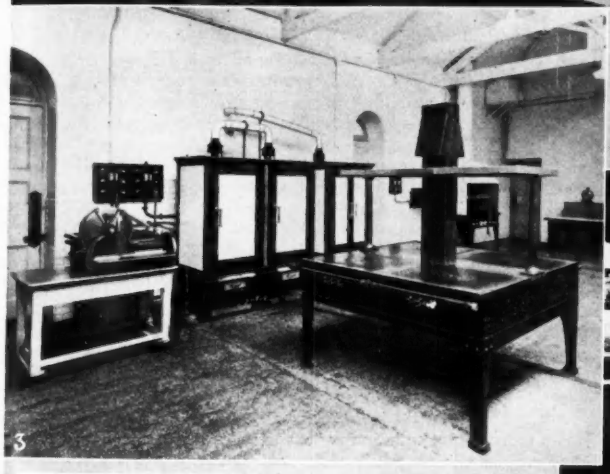
THIS diagram from *Elektrotechnische Zeitschrift* shows the essential features of a new instrument developed by W. Geyger for testing instrument, meter and relay coils for short-circuits between turns, prior to assembly. The principle employed is that of placing the coil under test in the magnetic field of a choking coil excited by a.c. If the tested coil contains a short-circuit, it acts as the short-circuited secondary of a transformer, and the magnitude and phase of the current in the primary (the choking coil) is accordingly altered. In the instrument illustrated, a moving-iron core D is embraced by stationary coils S_1 and S_2. The test choke P is connected



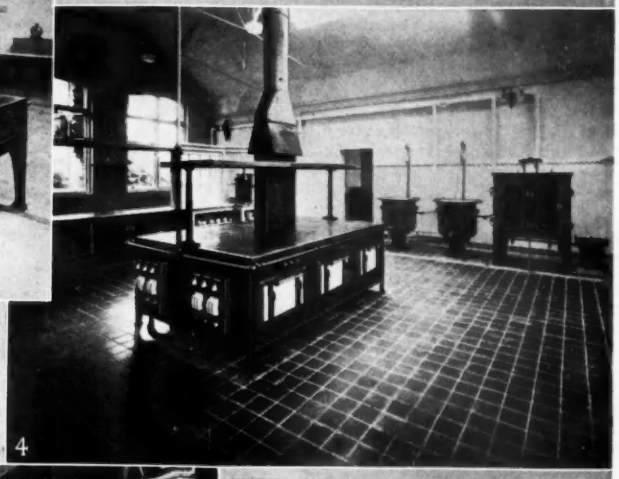
in series with S_2 and a condenser K, and tuned to resonance with the frequency of the a.c. supply. The coil S_1 is in series with a non-inductive, capacity-free resistance W. The two branch circuits thus formed are connected in parallel to the secondary of a protective transformer T. The resistances are such that the pointer normally stands at zero; also, the damping in the resonance branch is sufficient to render the ratio of the currents I_1 I_2 practically independent of the supply frequency within ordinary limits of variation. If a coil containing a short-circuit be threaded on the core-extension of the choke P, the effective resistance of the resonant circuit is increased by the energy dissipated in the short-circuited turns and a proportionate deflection of the pointer is produced. A zero-setting device provides the adjustment that may be necessitated by variations in supply voltage and instrument temperature. The power consumption of the testing apparatus is about 4 W, and the sensitivity is claimed to be sufficient for the testing of almost any coil used in measuring instruments and meters. The apparatus has been placed on the market by W. H. Joens & Co., G.m.b.H., Düsseldorf.

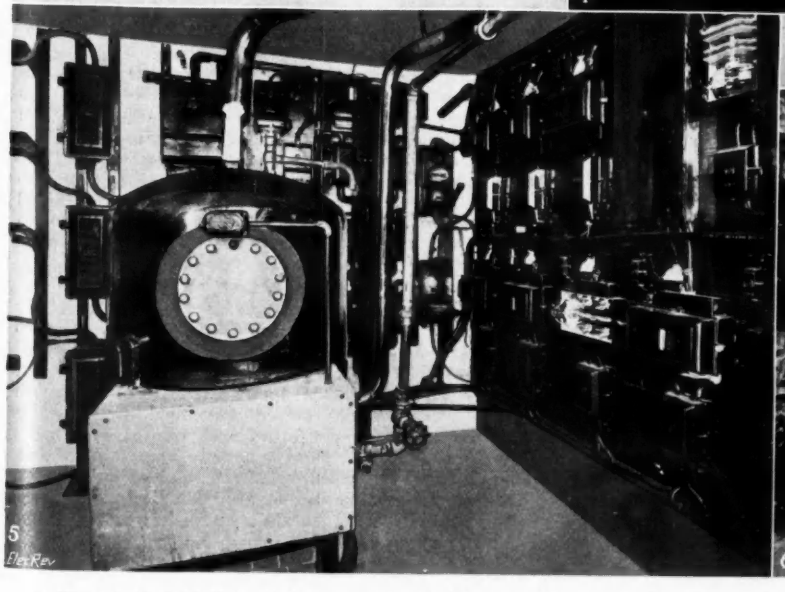


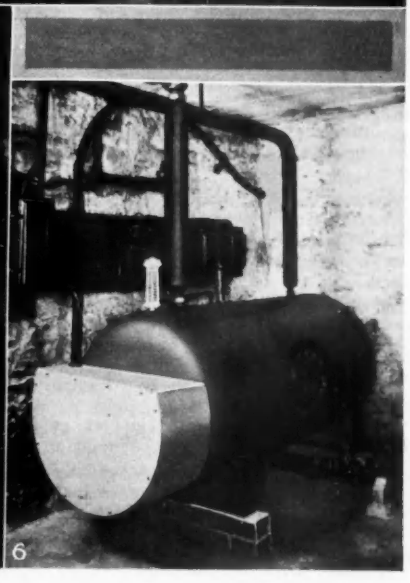




Hospital Heating and Cooking by Electricity at Plymouth **(See page 884)**







1. Electrically heated bowl, instrument and water sterilisers at the City Hospital. 2. A 100-gallon vertical cylinder for hot-water supply. 3. A part of the City Hospital kitchen: electric roasting ovens, with fish-fryers in the background. 4. The kitchen of the Mount Gold Orthopædic Hospital, showing the combined electric-gas central stove. 5. The control apparatus at the City Hospital. 6. A horizontal-type cylinder (125 gallons) for supplying hot water to the central female general ward.

Shockproof Supply Services. By G. E. Moore, A.M.I.E.E.

The case for the use of non-conductive coverings

UNDERTAKINGS appear to be within reasonably practical distance of obtaining service apparatus with outward parts of shockproof material. The term "service apparatus" may be regarded as embracing the sealing chambers, cut-outs, meters and other devices placed at the point of entry in a consumer's premises. By "shockproof" is here meant "non-conductive"; the expression "all-insulated" might be used instead but it is too loose for the present purpose. A metal casing, liable to become alive but earthed, is as shockproof in effect as a casing moulded from insulating material. But the protection is by no means so complete, for a conductive material is a danger should adjacent live parts be touched; indeed, the whole of a bonded and "earthed" collection of devices may itself become alive. (A somewhat similar distinction is made in the Memorandum relating to the Factory Act Electrical Regulations: "conductors" are, for definiteness, stated to be those electrically connected to the system.)

For some years the electrical industry has been passing through a "metal-cladding" phase. Many requirements, for mechanical or electro-magnetic reasons, can be satisfied only by a metal construction, but metal protection has become too accepted and it has brought its special complications.

With the coming of "Bakelite" (actually the registered trade name of a phenol formaldehyde condensation product) there has been a revolutionary change. An industry devoted to plastic synthetic moulding has rapidly established itself, and it is significant that a great firm with an enviable reputation for its ironclad products has established its own special plant and seeks to conquer fresh worlds—in an all-insulated universe.

Where mechanical, smoke- or gas-tight, fire-resistant or other qualities are not of paramount importance (and this must include the majority of installations—particularly with the general adoption of 400/230-V a.c. supplies) a completely shockproof equipment has many points in its favour. Indeed, it forms the only logical means of placing electricity at the user's disposal. This principle should apply with special significance to the supplier's service gear.

[*James Riddell*

Mr. G. E. Moore is assistant engineer in charge of testing, metering, and installation work in the Sunderland Corporation Electricity Department

Service Gear and Earthing

The latter, in simple cases, consists of sealing-box, cut-outs and meter—all externally made of metal. This has provided robust mechanical performance, but the use of a metal-clad construction has repeatedly given rise to controversy with regard to earthing. In a recent technical discussion, for example, one engineer urged that regulations specifically called for the earthing of service gear; another pointed out that apparatus merely had to be maintained in a safe condition and that earthing was not a specific need.

The reasons advanced in support of the common practice of installing apparatus *without* a deliberate connection to earth—it is assumed that this is tantamount to an "earth-free" condition—are varied. Some are forceful, some (like certain regulations) controversial, and some are illogical or inane.

Thus it is urged that, especially as regards the sealing-chamber and the feed side of the cut-outs, earthing increases the liability to breakdown during normal and particularly under various abnormal conditions. Such breakdown would not necessarily "clear" at the point primarily affected, and hence it can be said that by non-earthing one obeys the Commissioners' regulations relating to (a) maintenance in safe condition, (b) precautions as to fire risks, and (c) high insulation and prevention of discharge to adjacent metal. Moreover, the breakdown might conceivably cause more than purely localised difficulties and become a mains trouble with distant repercussions. In support of these arguments (and of the practice) is the fact that apparatus is of assured reliability, *e.g.*, cut-outs are simple, robust, and well-insulated, and watt-hour meters are capable of withstanding several times the marked voltage to earth. Also the installation is definitely carried out by "electrical authorities."

Where is the suitable "earth" to be found? It is a very real difficulty—perhaps the most serious difficulty of all to the earthing advocates. The consumer's earthing system is generally too light; or it may be in dubious condition or even non-existent—apart from the inadvisability of sharing it. A spike or plate earth is of doubtful value, often impossible and somewhat uneconomic. Even should a rising water main be available, general bonding to the water supply system is hardly to be advocated. Finally, the use of the metal coverings of service cables does not commend itself. In order to ensure general or local continuity of supply and expeditious service work, it is safer to carry out emergency wiring or test work without making dead. The persons concerned are regarded as toughened by experience and instinctively on the *qui vive*, but nevertheless the proximity of earthed metal casings militates against such work.

Various other arguments are encountered. For example: that the Electricity Commissioners do not insist on earthing, while under the Factory Act Regulations the supplier's apparatus is exempt; that earthing terminals are not provided on gear or that they are too flimsy (the latter a too-general complaint in all kinds of gear); that the whole practice of earthing throughout electrical engineering is wrong and that by it faults to earth are more likely; that consumers should not in any case touch service apparatus (*i.e.*, they "would deserve all they got"); that though the metering gear can be regarded as more accessible and liable to become alive, the "all *or nothing*" precept is inevitable for safety.

In Favour of Earthing

The use of composite service units, or their inclusion with ironclad switchgear or metal panels (all of which are, perforce, earthed), and the unavoidable earthing of ordinary service apparatus in definitely dangerous situations or under compulsion by Government inspectors, all show that the ill-effects of earthing can be exaggerated. Some time ago earthing terminals made a modest appearance, often farcically diminutive. Standard tests, moreover, have included rigorous conditions with "equivalent" earthing.

The I.E.E. requirements expressly indicate that under practically all conditions metal which forms the casing of, or is otherwise adjacent to, live parts must be earthed. Experience tends to impress upon one the good sense of such practice when the earthing is efficiently carried out. And thus those undertakings which expect a high standard of installation work and may also be empowered to administer national safety regulations, are liable to be invited by wiring contractors and others to remove the beams from their own eyes. It is, unfortunately, only too true that in a vast number of instances the supply service is a disgraceful hotch-potch, in no wise bettered by the unearthed state of the ironclad gear.

The three relevant features of the Commissioners' Regulations which, as mentioned earlier, may be interpreted as supporting earth-free service gear can (by an engineer convinced of the general applicability of the I.E.E. earthing clauses) be equally considered as calling for earthing. And there is also an opinion that in the requirement concerning the earthing of exposed metal forming part of an electric circuit, the term "electric circuit" signifies the conducting part and surrounding material. Meters and similar apparatus are less immune than service cut-outs from becoming alive. Their make-up, especially with regard to current coils, is not so robust and highly insulated. Engineers who have purchased lowest-tender apparatus below B.S.I. standard should have this as well as other related liabilities on their consciences.

All or Nothing

The supplier's metering apparatus, moreover, is generally more accessible and is often touched. Further, it may also be employed on circuits at points remote from the actual service; hence the "all-or-nothing" principle, here in favour of inclusive earthing, should apply, for to have contiguous metal-clad devices, some earthed and some earth-free, is definitely not a logical or safe practice. Consideration must also be given to encased parts separately mounted and containing conductors connected to different phases; the criterion here concerns the possibilities following breakdown to the case in more than one device, for simultaneous contact with two such faulty parts is not an unknown hazard.

In the earthing controversy the form of mounting for the service apparatus has been somewhat disregarded. Usually a board of solid or ply wood (*i.e.*, a comparative insulator) is employed. The use of such a support with non-earthed gear localises a fault but it is an anomaly where earthing is the practice, bonding of all metal casings being required; on the other hand, the adoption of a conductive panel brings all

Some Driving Forces in the Industry: Venner Time Switches, Ltd.

1. Mr. H. G. White, secretary and general manager. 2. Mr. E. E. Sharp (*Lafayette*), director. 3. Mr. L. C. Sharp, joint sales manager. 4. Mr. A. G. McLaurin (*Wykeham Studios*), chief draughtsman. 5. Mr. F. R. C. Rouse (*Wykeham Studios*), technical manager. 6. Mr. R. C. Graseby (*Elliott & Fry*), managing director 7. Mr. A. Selley, Buying and Progress Dept. 8. Mr. B. Sleath, joint sales manager. 9. Mr. J. Selley (*Corbett*), sales engineer. 10. Mr. S. J. Matthews (*Wykeham Studios*), electrical engineer. 11. Mr. R. L. Graseby, Mechanical Engineering Dept. 12. Mr. H. G. Towner (*Ward's Studios*), sales engineer.

Shockproof Supply Services (*Concluded from opposite page*)

metal-clad parts to a similar potential and earthing either "happens" or becomes a deliberate necessity. The service cabling has also tended to remain outside the arguments. With regard to metallic sheathing, piping, or other protection, the following points are important:—Normal accessibility in the event of it becoming alive; the possibility of pipes containing gas or inflammable liquid touching it; unauthorised use as an earth.

"All-insulated" Devices

The general opinion favours non-earthing as the safer alternative; nevertheless, there is considerable uneasiness among even the confirmed devotees. Now, with the very rapid adoption of outer coverings and bases of materials which are insulators and are mechanically robust, the way lies clear to the adoption of shockproof service apparatus; then arguments both for and against earthing become meaningless.

"Bakelite" and other similar products are not only striking in their neat and clean-cut finish, but there is no reason to fear rusting and corrosive effects. This is especially important with regard to integrating meters and the like; after quite short use in some situations, rust or other disintegration is apparent. Moreover, the meter engineer is often by no means certain as to the permanency of interior protective coatings—naturally the shedding of enamel or vagrant particles is always serious. Internal wiring should be safer and easier and the terminal block and base homogeneous. Reduction of weight may be another gain.

Uneasiness may ensue as to the integrity of meters having their internal parts mounted on, and completely surrounded by, an insulating material. There does not, however, seem any reason why requirements as to mechanical soundness, assurance of permanence, dust-tightness and non-inflammability should not be readily met, while the advantages regarding terminal mounting and diminution of internal interaction are apparent. The time is ripe for a quickening of practical support for installations completely shockproof in respect not only of fixed runs and fittings but also of portable appliances.

It would be a gross anomaly to fix a non-shockproof service in the premises of a consumer whose equipment had no conducting parts other than those carrying the current. On the other hand, the utilisation of shockproof casings for service gear must inevitably be a stimulus to their use for consumers' installations—a consummation which is especially desirable with the general adoption of 230 V a.c. Each electrical accident, though in itself isolated, or even the result of utter stupidity, causes widespread uneasiness, and the writer looks to the general encasing in non-conductors as a safety development that will counter this.

Shockproof service cut-outs of various makes have been available for some time, and all-insulated sealing-chambers and meters are also here. It should be a practical step to the similar enclosure of demand-indicators, time-switches, and other related apparatus—such as has been already effected in certain specialities by far-seeing makers.

The mounting may be conductive or not, but obviously the usual ply or other form of wood board will be in keeping and cannot provide a contiguous and dangerous earth for maintenance men; one foresees wood being succeeded by an insulating composition with greater survival and fire-resistant qualities. The service cable, on the whole of least significance, should nevertheless be shockproofed. This could be effected by continuing the jute or other final covering over the whole of the underlying armouring or sheathing; where cable piping is carried into the building, it could, if not of non-conducting material, be suitably shrouded by special tape or other means. Thus any form of tampering, or the very real danger that exists from gas pipes and the like, would be countered.

Hospital Heating and Cooking. By M. O. F. England, A.M.I.E.E.

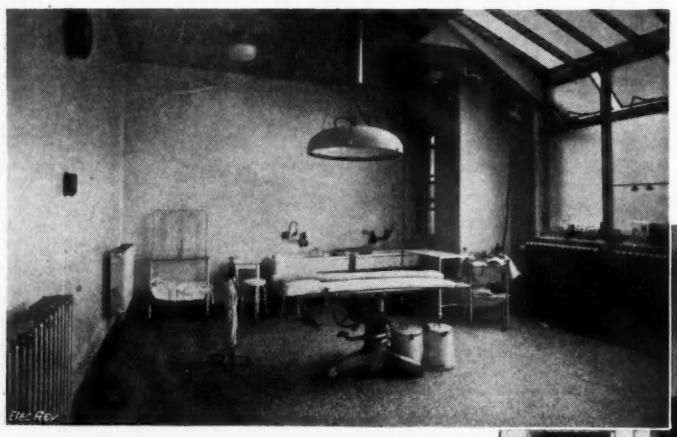
Electrical equipment in two Plymouth institutions

ONE of the most ambitious electrification schemes connected with large hospitals yet undertaken in this country was that of the City and the Mount Gold Hospitals (recently opened by the Duke and Duchess of York)—both of which are under the control of the Plymouth City Corporation.

The City Hospital, which was built about fifty years ago, comprises thirteen blocks, having 500 beds and a staff of 125. The fuel-burning boilers were becoming unsafe to use, steam pressure having to be reduced; also heavy losses due to fractures occurred in the distributing steam mains to the calorifiers in the various blocks. Mr. R. Illingworth, A.M.I.E.E. (then deputy electrical engineer to the Corporation), worked out a scheme to use electricity as the principal "fuel"—treating each block of the hospital as a separate unit; full advantage was taken of the flexibility of thermostatic control of temperature, both for water and air heating, and the savings realised by dispensing with a manually operated inefficient central boiler plant. The suggestions were supported by the chairman of the Public Health Committee, Alderman H. M. Medland, and approved by the Ministry of Health.

The Heating Scheme

The heating apparatus was installed without interfering in any way with the routine organisation of the hospital or the comfort of the patients; it consists of 213 thermostatically controlled "Electro-Vapour" convector heaters similar to hot water central heating radiators. The pleasant and even temperature maintained with practically no labour or maintenance forms a contrast to the inefficient central open fire stoves which were previously fixed in the wards. Ward radiators are mounted on feet for hygienic purposes, the walls being found to be unsuitable for carrying brackets upon which to mount them.



"Electro-Vapour" radiators in the Plymouth City Hospital. Above, the operating theatre; right, one of the female general wards

The radiators generally have a loading of from 2 to 3 kW each, the total connected load for heating the hospital being 434 kW. Separate single radiators are thermostatically controlled by "Satchwell" two-pole instruments acting direct without contactors. Where a number of radiators are controlled by one thermostat, three-wire "Satchwell" instruments control motor-operated switches housed in one of the old calorifier chambers, which also acts as an electric boiler house for the supply of hot water for each block.

In the centre of each ward is an imitation electric coal fire; these were installed purely for psychological reasons as they encourage the convalescent patients to get out of bed and sit round them. As the original coal stoves had descending flues, the cables for the electric fires were run in the old channels. Local fuseboards were placed outside their respective wards, and by utilising the old hot-water pipe ducts along the passages to house the cables, it was unnecessary to disturb the flooring. Lead-alloy sheathed cable was used throughout for the heating installation, except in the case of the operating theatre. It was possible to conceal all cables in the wards by drawing them through the space between the lath-and-plaster and the outer wall, without damaging the decorations.

In the operating theatre there are five 2.5-kW "Electro-Vapour" radiators controlled thermostatically, each mounted upon wall brackets. The temperature in the operating theatres is 70 deg. F., and this, coupled with the fresh air needed and the large amount of glass necessary in a room of this kind, raises considerably the watts per cu. ft. required, as compared with rooms where the temperature is 10 deg. F. lower. From observations made it would appear that the cost of heating generally is well within the original estimate.

The Hot-water Supply

An electrical salesman often greatly under-estimates the amount of hot water required, for in practice nearly as much water is wasted as is used—a point which the heating engineer has always known, and the electrical engineer is only just beginning to realise. Each of the thirteen blocks of the City Hospital has been treated separately, electrically heated thermostatically controlled cylinders being installed in the chambers previously occupied by the original calorifiers. The capacities of the cylinders vary from 50 to 250 gal., the total connected load being 371 kW. Owing to the soft nature of Plymouth water the storage cylinders and the whole of the connecting pipework are of copper. The cylinders are of orthodox construction, each being fitted with withdrawable immersed elements, a thermostat set to maintain 130 deg. F., and a safety valve and manhole; they are lagged with asbestos. To protect element heads and connections galvanised protection shields have been fitted.

Tests were made of the efficiency of the hot-water supply installations, which was found to be exceedingly high. Heat losses in systems where water circulates (as is the case with the hospital), as opposed to dead-end draw-off, frequently prevents the use of electricity altogether. Thus, an efficiency test on a lagged lavatory cylinder with open outlet and on the same cylinder circulating water through but 20 ft. of pipework will give a good result in the former instance and a poor one, unless really efficiently lagged, with the latter.

A new sterilising room has been formed in which the most modern equipment is installed. This includes a pressure-type 6-gal. 3-kW water steriliser and a 5.5-kW instrument steriliser.

Cooking Equipment

Roasting and baking had previously been done in old-fashioned coke-fired peel ovens. The new equipment consists of a unit comprising two large 11-kW electrically heated ovens, principally for milk puddings and pastry, and a large single compartment 16-kW roasting oven, which also serves to cook the breakfast bacon. These ovens have heavily lagged enamelled interiors, and are of the vented type. Fish is fried in a two-pan appliance requiring 15 kW, and there is also an electric grill with a 24-in. by 12-in. grid loaded to 4.5 kW. The boiling table is gas heated, and all steaming operations are carried out by live steam supplied by the steam boiler already referred to. Wiring for the electric cooking apparatus, cylinders and sterilisers is v.i.r. cable in screwed welded conduit.

Electricity is supplied from the Corporation's 6,600-V three-phase ring main. Two 500-kVA transformers are installed, giving a 400/230-V supply to the hospital. Figures for the cost of heating are not yet available, but for hot-water supply approximately 11,000 kWh is consumed weekly. For cooking—bearing in mind that the kitchen scheme is a mixed one—the approximate cost of running the electrical appliances for 600 persons is 0.7d. per head per week. The cost per kWh is 0.5d.

The entire equipment at the City Hospital, including the electric heating and hot water supply installations, kitchen cooking appliances, and sterilisers, were manufactured and installed by Messrs. Benham & Sons, Ltd., who also carried out the kitchen installation of Mount Gold Hospital.

Empire Broadcasting

The new B.B.C. short-wave station

FOR the Empire broadcasting service which is to be commenced by the British Broadcasting Corporation on December 19th, transmitting from the new short-wave station at Daventry, the Empire has been divided into five zones, so as to permit transmissions at different wavelengths and at different times. Each zone is provided with two wavelengths, so that the two station transmitters can work simultaneously, thus giving double the chance of satisfactory reception. The wavelengths employed are 25.5 and 31.3 metres for Australasia and India, and 31.3 and 49.6 metres for South and East Africa, West Africa, and Canada.

The station embraces a building with a central block containing the transmitting hall, control rooms and offices, and with two wings, one housing the motor-generators, switchgear and sub-station equipment, and the other the valve water-cooling plant, boiler room and stores, &c., as well as five different groups of aerials corresponding to the transmission zones. All the equipment is British made, the transmitters and aerial arrays having been supplied by Standard Telephones & Cables, Ltd., the motor-generators by the English Electric Co., Ltd., and the transformer equipment by Ferranti, Ltd.

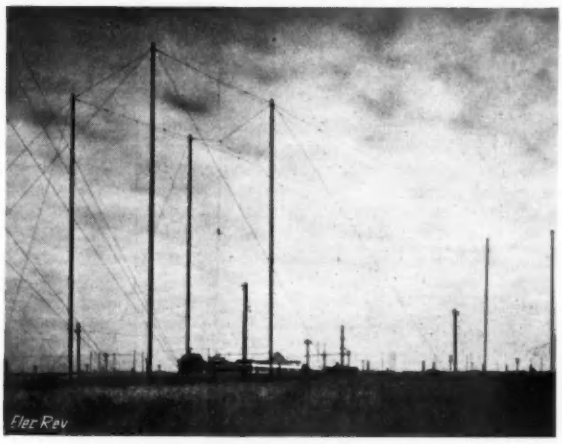
Quartz Crystal Control

The incoming lines terminate in the control room which contains the low-frequency amplifiers necessary to raise the programme to a suitable level for feeding the transmitters, and also switching apparatus for the distribution of the programmes to the two separate transmitters. The control and checking of the programme is carried out in this control room, a second control room being provided for checking the input to the transmitter. Both control rooms are acoustically treated and equipped with loud speakers. The amplifiers are supplied with d.c. from the main a.c. supply of 415 V 50 cycles. Two desks in the centre of the hall are so equipped as to enable each engineer to listen to the programme which is being radiated by the transmitter which he is controlling.

To obtain the necessary high degree of accuracy, the frequency of each master oscillator valve is controlled by a quartz crystal, a separate crystal being employed for each wavelength used. This apparatus is housed in a small unit beside the first cubicle of each transmitter. The output of the oscillator-unit is connected to the input of the first transmitter unit, which contains the frequency-doubling stages, the modulating stage and the first modulated amplifier.

The Amplification Equipment

Amplification is carried out in the second of the three transmitter cubicles, each of which contains a stage of push-pull high-frequency amplification. The first amplifier employs two 2-kW water-cooled valves and the second two 10-kW valves. The fourth cubicle contains the final amplifier consisting of four 15-kW water-cooled valves, push-pull connected, the output circuits of which are coupled to the aerial feeder. The circuits of the last three stages, that is, the intermediate amplifier, first power amplifier and main power amplifier, are of the balanced bridge type. Special precautions have been taken to stabilise the circuits and to lay out the components in such a manner that spurious inductances and capacities are either made use of or eliminated entirely. The necessity for avoiding stray capacities and inductances and for keeping the circuits quite symmetrical precludes the possibility of using square valves, *in situ*, as in the B.B.C.'s regional transmitters. The design of the tuning circuits is such that the values of inductance can be quickly changed, in some cases by altering tappings, and where large changes are required by changing the coils. The outgoing feeders from the power stage in each transmitter are connected to an aerial changing panel mounted above each transmitter. On each panel is a specially designed selector switch which enables either of the transmitters to be connected to any one of the aerial systems.



The West African aerial array

The Power Supply

Power is received from the Northampton Electric Light and Power Company's sub-station on site at 11,000 V, 50 cycles, 3-phase, the pressure being reduced by a 300-kVA transformer. High pressure d.c. for the first power amplifier and main power amplifier is obtained from a six-phase rectifier with a 10,000-V, 6-A d.c. output. The rectifier valves are of the water-cooled thermionic type and are placed with their associated interphase reactors, transformers and induction regulators. They are motor operated with push-button control. A separate rectifier serves each transmitter equipment. All the power supplies for the transmitters are provided by motor-generators housed in a separate room. These twelve machines are divided into three separate groups, two groups being used at any one time to supply the respective transmitters to which they are switched. The third group acts as standby. The first group supplies the grid-bias voltage for all valves in the transmitter. The second, which has two generators coupled to one motor, supplies the anode voltages to the circuits of the modulator-oscillator unit. The third set, also with two generators, supplies the anode h.t. to the intermediate amplifier. The fourth set serves for filament heating of the main power amplifiers.

A view of the transmitter hall and the valve water-cooling fans and circulating pumps

The outputs of the generators are taken to a cubicle switchboard in the motor-generator room. All the motors are squirrel-cage, three-phase, induction machines. Power for the master oscillators is received from a 220-V a.c. supply provided by a 15-kVA single-phase transformer, which also serves for lighting and the auxiliaries. The water for valve cooling is re-cooled by air blast type coolers, embracing fans and large radiators. In the aerial groups there are twelve separate aerials in addition to six omni-directional aerials. Each is connected to the changing panel by feeder lines and consists essentially of a short vertical wire backed by a similar reflecting wire. In the case of Australia, it is possible to send wireless signals either way round the great circle.

Diode Regulators

A simple method of voltage control

IN factories or power plant where voltages must be kept constant within one per cent., diode regulators compare well as regards accuracy and speed of reaction with the best mechanical regulators. The diode regulator can, in principle, be applied to many types of control, and in certain cases can also be successfully applied to the regulation of output voltages

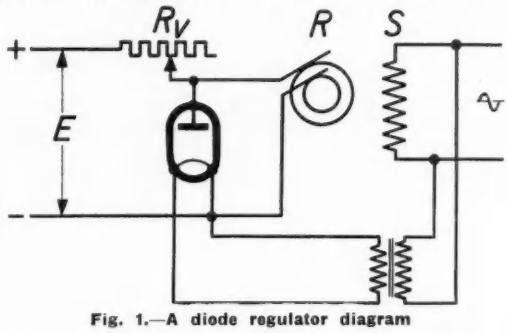


Fig. 1.—A diode regulator diagram

of d.c. generators, but it is better to use triode regulators for this purpose (see ELECTRICAL REVIEW, September 23rd, p. 417).

Fig. 1 represents the circuit of an alternator of which the output voltage is controlled by a diode. A d.c. source E supplies excitation current, *via* a resistance Rv, to the rotor of an alternator. The anode-filament circuit of the diode is connected in parallel with the excitation winding. The filament is supplied by the secondary of the transformer, the primary of which is connected to the stator winding. The diode has a certain definite emission corresponding to a predetermined voltage of the alternator. Should the voltage of the alternator decrease, the filament current of the diode will decrease and consequently the emission also, the decrease in emission being proportionately larger than the decrease in filament current. The rotor and diode being both connected to the d.c. supply, the current passing through the rotor increases, hence the excitation of the output voltage increases as a natural consequence.

The diode can, however, also be connected in parallel to the field winding of an exciting dynamo instead of to the excitation winding of the alternator. In order to obtain greater accuracy without it being necessary to increase the output of the diode, the excitation dynamo should be operated in the unsaturated area. In this case a small variation of the emission will result in a large variation of the output voltage.

Details of Construction

Philips's regulator No. 4105 for alternators consists of six type 1202 diodes connected in parallel (fig. 2). A choking coil *sm* in series with the filaments operates in the saturation field, causing variations in filament voltage to be more intensive than those in the transformer voltage. A filament current transformer T with secondary tappings adapts the voltage of the regulator to that of the alternator. The voltage can be accurately adjusted by employing a regulating resistance Rr (decreasthis resistance results in a corresponding decrease of current, hence the output voltage increases proportionately; the reverse effect is obtained by increasing the resistance).

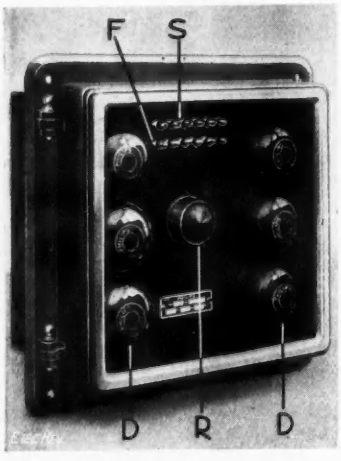


Fig. 3.—Diode regulator, type 4105
D diodes, R control knob, F fuse lamps, S indicator lamps

For reliability a number of small diodes are used in parallel, so that when one becomes defective the others take over its work. Further precautions include indicator lamps s and fuse lamps z in the anode circuit of each diode. Should one of the diodes fail, its corresponding indicator will cease to glow, and a short-circuit between anode and filament will cause the fuse lamp to break down.

Compound Resistance

It is possible to modify the nature of the output voltage by means of so-called "compound resistance" in such a way that the voltage will remain absolutely constant with two greatly different values of load. It is also possible to determine the compound resistance so that the alternator output voltage will increase correspondingly when an increase in the load occurs. This resistance Rc (fig. 2) should be connected in series with the secondary winding of the filament current transformer. The sense of the voltage excited in the resistance by the load current should be in the opposite direction to that of the secondary voltage of the filament current transformer. Thus an increasing load decreases the filament voltage and the emission consequently decreases too. The excitation current increases and as a natural consequence the alternator voltage will rise as well.

With electro-mechanical regulators the excitation increases abnormally when a short-circuit occurs, resulting in a consequent abnormal increase in short-circuit current. Since a diode regulator is adjusted in such a way that with full load on the alternator the emission of the diodes is low, this abnormal surge of current will not occur. Should the load increase through overload or short circuit, the emission can only decrease as far as zero. Consequently the excitation

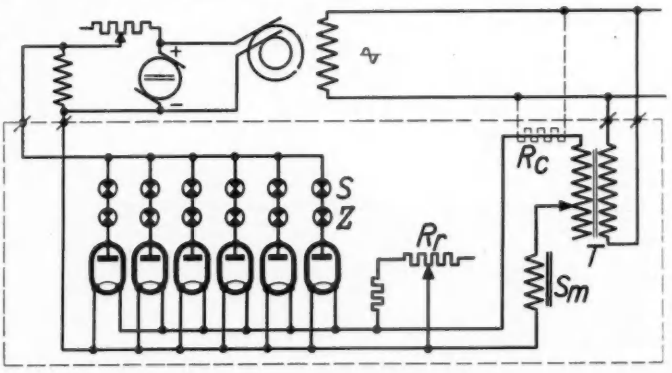


Fig. 2.—An alternator voltage controller circuit

current increases slightly, thus the short circuit will only be a little higher than the excited current when no regulator is used.

To ensure that the diode regulator operates correctly it is necessary that the exciting voltage of the exciting dynamo (equal to the anode voltage) should not be too low. The minimum with tubes of type 1202 should be approximately 25 V. Most accurate regulation is obtained when the exciting dynamo does not operate quite at saturation point when the generator is fully loaded. If these requirements are complied with it is possible to regulate pressures of up to 100 kV with an accuracy of one per cent. with only one regulator type 4105; under especially favourable conditions plant generating 300 kV can be regulated.

The Physical Society's Exhibition

The twenty-third annual exhibition of scientific instruments and apparatus, arranged by the Physical Society, will be held on January 3rd, 4th and 5th at the Imperial College of Science and Technology, South Kensington. The leading manufacturers of scientific instruments will exhibit their latest products in the trade section; the research and experimental section will contain contributions from most of the important research laboratories in Great Britain; and there will be a special sub-section devoted to experiments of educational interest. In addition, the work submitted for the craftsmanship competition by apprentices and learners will be on view. Discourses will be delivered each day at 8 p.m. as follows:—January 3rd—Dr. Allan Ferguson, M.A., "Surface Tension and its Measurement" (illustrated by experiments); January 4th—Mr. R. A. Watson Watt, B.Sc., "Cathode Ray Oscillography" (illustrated by experiments); January 5th—Mr. F. Hope-Jones, M.I.E.E., "Time Measurement: Old and New" (illustrated by experiments). Tickets may be obtained from the Exhibition Secretary, 1, Lowther Gardens, Exhibition Road, S.W.7. Admission to the exhibition on the last day will be free, without ticket.

Progress in Electricity Supply

The twelfth annual report of the Electricity Commissioners

THE twelfth annual report of the Electricity Commissioners covering the twelve months ended March 31st, 1932, has been issued this week (Stationery Office, 3s. net).

Although output declined in Central Scotland and North-East England by 104 million kWh, the overall increase was 537 million kWh, bringing the total generated by 660 authorised undertakings (in 483 stations) to 11,417 million kWh—an increase of 4.5 per cent. over the previous year. Including the output of fifty-five stations owned by railway and tramway authorities and certain non-statutory undertakings, the total kWh generated was 12,813 million kWh; for traction the increase was 22 million kWh, but from the non-statutory undertakings there was a decrease of 43 million kWh.

The number of stations was twenty-one less than in the previous report. The increased output was accompanied by a reduction of 0.7 per cent. in the consumption of coal and coke; fuller particulars of this aspect were given in the ELECTRICAL REVIEW of June 10th.

Generating Plant Extensions

The aggregate capacity of new generating plant sanctioned amounted to 153,238 kW, compared with 892,077 kW in the preceding year and an annual average of 550,000 kW during the past eleven years. Nine consents related to 61,387 kW in new stations, the chief of which was the Tir John North station at Swansea (two 30,000-kW sets). Two consents for the extension of selected stations related to a 15,000-kW set for Norwich Corporation (ELECTRICAL REVIEW, October 28th, 1932) and a 10,000-kW set for the Hoyle station of the Cornwall Electric Power Co. Other principal consents covered an 18,000-kW set for Lots Road (London Underground Railways), a 20,000-kW set for Neasden (Metropolitan Railway), and a 20,000-kW set for Stonebridge Park (L.M.S. Railway).

Fulham Borough Council continued experiments with gas washing, and early this year independent tests were carried out by the Government Chemist, who recommended the process as a solution of the problem. The Board of Inland Revenue has agreed that the closing down of a generating station in favour of bulk supply does not invalidate an undertaking's claim to allowances for obsolescence under the rules applicable to Schedule D of the Income Tax Act.

Co-ordination of Distribution

Special Orders were made for the establishment or extension of thirty-eight distribution undertakings and eighty Fringe Orders for supplies to specific premises. Sanctions were issued in 790 cases to public authorities for loans aggregating £14,151,000, over 43 per cent of which was for mains. The number of bulk supplies taken or arranged for by authorised undertakings (including reciprocal supplies) was 593. Consents were issued to forty-six undertakings for the alteration in the declared system or voltage of supply.

The concentration of generation in a limited number of selected stations operated under the directions of the Central Board will enable authorised undertakings to devote themselves solely to distribution and commercial development. Almost the whole of Great Britain is now covered by supply powers, but the public can be catered for only by the provision of suitable distribution networks, facilities for the wiring and equipment of premises, attractive two-part tariffs, and propaganda. The centralisation of generation must be supplemented by co-ordination of distribution on a standardised system.

The consumption of electricity per head of the 1930 population (44.79 million) was about 210 kWh.

New connections and new consumers in 1930-31 amounted to 1.29 million kW and 534,000 respectively. With the resumption of more normal industrial conditions and the consequent stimulus to the demand for motive power, the prospects for further expansion of the supply industry are most favourable. The annual sales of electricity by the end of the next decade should show an increase of about 10,000 million kWh upon the present figure.

Rural Demonstration Schemes

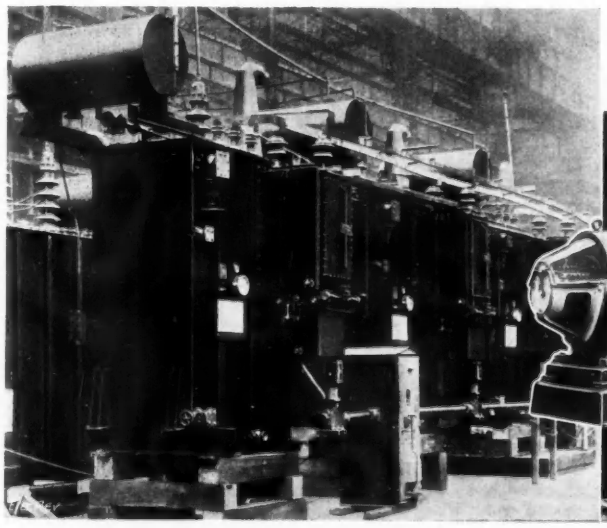
At the end of the period under review the construction of the main transmission network for the Bedford rural demonstration scheme was almost completed; about ninety-four miles of 11-kV mains (seventy-nine miles overhead) and 33.5 miles of 400-V mains (eight miles overhead) had been constructed and supplies were available in thirty-one parishes. The costs of construction of the 11-kV overhead line worked out at £239 per mile for two 7/12 s.w.g. and £333 for three 7/12 s.w.g. galvanised-steel conductors; £375 for three 0.05 sq. in. and £333 for three 0.025 sq. in. s.c.a. conductors.

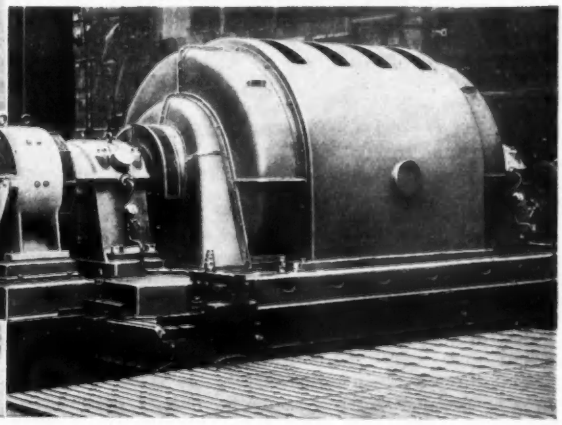
The centres of the villages did not lend themselves well to l.v. overhead construction, but offered unusually favourable conditions for underground cabling in easily worked subsoil in grass verges. Four-core 400/230 V p.i. l.c. jute-served cables were laid at an average cost per mile of £593 (cable £389, other materials and labour £204). The cost of 359 short services averaged £4 13s. 6d. (cable £1 18s. 2d., other materials and reinstatement £1 9s. 6d., labour, excavating and jointing £1 15s. 10d.).

About 2,360 consumers took 1,229,000 kWh, of which 39.7 per cent. was for domestic uses, 3.4 per cent. for farms, and 56.9 per cent. for factory power, &c. The average revenue per kWh was 1.327d. The cost of energy was valued at £3.084 per kW and 0.194d. per kWh. The average cost per kWh sold (allowing for distribution losses, etc.) was 0.534d.

The total capital expenditure was £156,493. This included £11,063 for apparatus and wiring on hire or hire-purchase; installations on consumers' premises included 591 cookers, thirty-six wash boilers, and twenty-nine storage heaters. There was a deficit, after meeting capital charges, of £2,279, but as an essential feature of the scheme has been the provision within about two years of a supply to almost all the inhabitants, some of the preliminary expenditure is not yet reflected in increased revenue.

The Norwich demonstration scheme which covers 125 sq. miles of almost wholly agricultural country is only in its initial stages. The load connected was 1,080 kW, consisting of 269 kW of lighting, 735 kW of cooking heaters, and 76 kW of power. The average size of farm motor was 5.5 h.p. About 192,000 kWh was sold, yielding a revenue of £1,876 (2.35d. per kWh), of which £1,213 (2.1d.) came from domestic consumers, £136 (1.68d.) from farms, and £527 from business premises.





The Metropolitan-Vickers Electrical Co., Ltd., recently shipped three large synchronous condensers (20,000 kVA, 10,500 V, three-phase, 50 cycles) to the Victoria Falls and Transvaal Power Co. Each condenser is connected to the line through a bank of three 6,667-kVA, 40,000/10,500-V, single-phase outdoor transformers.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Post-war High-pressure Boiler Development

IN a paper which Messrs. C. H. Davy and C. H. Sparks read at a joint meeting of the INSTITUTION OF ELECTRICAL ENGINEERS, the INSTITUTION OF MECHANICAL ENGINEERS, and the INSTITUTES OF FUEL AND MARINE ENGINEERS, at the I.E.E. building, London, on December 15th, data are presented which show the rate of increase in cost with rising pressure for arrangements of boilers, superheaters, economisers, and air heaters, both stoker-fired and pulverised-fuel-fired, with increase in final steam temperature, and, alternatively, with reheat. The effect of feed-water temperature on the extent of boiler, economiser, and air pre-heater surface is also discussed, and the codes in force governing the thickness of boiler tubes

Messrs. C. H. Davy and C. H. Sparks, the joint authors of the accompanying paper

and the methods adopted for the fabrication of high-pressure steam drums are referred to.

Natural-circulation boilers installed for high-pressure service since 1920 are listed according to the steam cycle on which they are operated, and plants installed in different parts of the world are described. Consideration is given to directly heated forced-circulation boilers, the Benson and "once through" series boiler being the most advanced of this type. Some particulars of the indirectly heated Schmidt and Löffler boilers are included, and the "special effect" experimental "Atmos" boiler is described.

The Limitation of Materials

Present knowledge is adequate to take care of the stresses which arise when high pressures are used, but the alloy steels available at the present day would scarcely permit the utilisation of steam temperatures in excess of 1,100° F. even for non-commercial plants, whilst from the economic point of view the capital expenditure involved for the provision of suitable materials makes it difficult to realise the fuel saving obtainable by increasing the final steam temperature above that for which ordinary steels can be used.

The most difficult problem will arise if and when experimental work with higher steam temperatures shows the possibility of operating turbine machinery at steam temperatures in excess of 1,000° F. In the authors' opinion, temperatures of this order are not likely to prove particularly attractive to steam users, but the general trend in this direction cannot be denied.

If the most suitable position in which to place a superheater for such a high temperature is considered, difficulties are immediately met. A convection superheater would have to have an extremely large heating surface and could not be accommodated in many designs. A combination of radiant and convection surface might permit the temperature to be obtained, but with fuels which contain ash it is difficult to keep the radiant surface in a sufficiently clean state to ensure a constant temperature when firing at high rates.

The expense of steam piping and valves to withstand these exceptionally high temperatures will also militate against the adoption of very highly superheated steam. There appears to be some possibility that if these high final steam temperatures ultimately prove satisfactory the superheating will take place at the turbine with auxiliary firing either by gas or oil, so that normal boilers and superheaters and steam piping and valves can be utilised. The comparatively small amount of flue gas from such an independently fired superheater required to add the last few hundred degrees of superheat could be passed back to the economisers or air heaters of the boilers.

Present Tendencies

The large increase in capacity of boiler units per square foot of floor space occupied, though due in some respects to the disposition of the heating surface, has been mainly brought about by the great improvements in mechanical firing equipment, side by side with furnace-wall constructions capable of withstanding extreme conditions of heat release, but also permitting high efficiencies to be maintained over a wide range of load. Because of the lower investment cost, the tendency in America has been to install larger turbo-alternators with fewer boiler units to steam them; this has resulted in the building of very high-capacity boilers, fired by fuels in suspension. In Europe, turbo-alternators and boiler units are generally smaller and employ pulverised fuel or stoker firing.

In conclusion, the authors hazard an opinion as to the probable direction in which developments may proceed. It is improbable that special-effect or forced-circulation boilers will displace those of the normal type, because they are not so easy to operate and do not appear to offer any price advantage. The power plant engineer requires simplification of equipment, resulting in improved reliability, rather than some small improvement in thermal efficiency at the expense of complication. Simplification will extend not only to the boiler room, but to the turbine room also, and lead ultimately to gas reheating at the boiler being abandoned.

Whilst the trend, both in Europe and in America, has been definitely towards higher final steam temperatures, it seems probable that these will be limited to about 850° F. by the use of ordinary steels until such time as the cost of special steels is materially reduced; the commercial advantage of a slight increase in steam temperature, involving the use of special steel, appears doubtful. The demand for high-pressure boilers will continue for power-station work, but super-pressure boilers appear to have their application limited largely to industrial work and the compounding of low-pressure stations, where conditions permit. The recovery from the abnormal economic conditions existing at the present time is likely to be slow, with the result that commercial efficiency will take precedence over thermal efficiency.

The Case for Main-line Electrification

IN the paper on "British Main-line Electrification," which Mr. F. Lydall read at the INSTITUTE OF TRANSPORT, London, on December 12th, not much is said about the electro-technical side of the subject, for the author thinks that enough has been done all over the world to convince even the most hardened sceptic as to the security of the supply of power to the railway and its transmission to the trains, and it will be admitted that electric locomotives and trains are at least as free from failure as steam locomotives.

The principal characteristics of suburban passenger electrification are the result of the employment of the multiple-unit system of trains. The author points out the opportunities which exist for taking advantage of this system for general main-line passenger service also, though the majority of goods trains on a busy main line would have to be hauled by locomotives, and the only way in which the multiple unit system could be applied to them would be by providing comparatively small locomotives, using one or two coupled together in multiple, according to the load to be hauled. This would be a means of economising in capital outlay and working expenses.

Is Delay Justified?

The financial aspect is not discussed in detail. The present position is that in spite of the general advantages offered by electrification, and the finding of the Weir Committee that conversion to electric operation would do more than pay the interest charges on the new capital, no definite steps have been taken to initiate a programme of construction. Various reasons have been assigned for this absence of enthusiasm, but the author suggests that if electrification is worth while on its merits it is not in the national interest that it should be held up indefinitely by the depressed state of the railway company's stocks.

The paper shows that railway electrification is progressing on a considerable scale in other countries. It is clear, therefore, that the responsible authorities in these countries are not dissatisfied with what has been done in the past, and are confident that the anticipated economies and benefits will be

realised. Although the estimated financial results of the various electrification schemes now in hand and projected have not been disclosed generally, it may be taken for granted from what has been published in some cases, and the absence of information in others, that a return of more than one or two per cent. after the payment of interest on the new capital is not expected. This, however, has not deterred the authorities from going forward.

A Revenue-earning Asset

In conclusion, the author suggests that more consideration should be given to the value of electrification as an asset available to the railways in their competition with road transport. This feature of electrification, though not fully appreciated, is in a general way admitted; but as it is not susceptible of calculation, there is a tendency to concentrate attention solely on the estimated savings in the working expenses. Undoubtedly a good deal of the long-distance passenger traffic which has developed on the roads would be attracted to the railways if full advantage were taken of the possibilities of electrification in speeding up all classes of trains and improving the lighting, heating, and ventilation of the coaches. Recently a certain number of "crack" trains have been accelerated, but still higher speeds could be attained without difficulty with electric working. For example, the present improved timing of the 5.30 p.m. from King's Cross to Newcastle could be reduced by 45 minutes without exceeding the present maximum speed. Apart from such trains, however, it is probably safe to say that the general average speed of passenger trains throughout the country could be raised by at least 20 to 25 per cent. by electrification. The combination of higher speed, comfort such as is impossible in road vehicles, and a frequent service, could not fail to attract a considerable proportion of those who now prefer to travel by road.

The recovery of goods traffic is equally important. The loss in revenue suffered by the railways in respect of merchandise is even greater than the loss on the passenger traffic. There can be no question that electrification would make possible a considerable speeding up of merchandise transport and enable the railways to compete for traffic on more nearly level terms, and in many instances would make their offer more attractive than that of the road transport agent who is, in the present state of the law, freer to quote a low price.

This "chandelier" in the Rockefeller Centre, New York, is claimed to be the largest in the world. It is 25 ft. in diameter and weighs 6½ tons

Varying Views on Electric Heating

THE discussion on the paper by Mr. A. H. Barker on "The Relative Fuel Economy of Electricity, Gas, Oil and Solid Fuel as Heating Agents"—which was read before the INSTITUTION OF ELECTRICAL ENGINEERS and partly discussed at the meeting on December 1st—was resumed and concluded on December 8th.

Mr. J. Roger Preston maintained that 40s. per ton for solid fuel was too high; good coke could be bought in London for 30s. per ton. Mr. R. Grierson said that electric heating had introduced a new technique of comfort, and the aim was not so much to heat a building as to prevent excessive cooling. Architects were now adopting methods of construction which had in view keeping the buildings warm in winter and cool in summer. He showed a number of slides which indicated that although on the basis of the method in the paper a building with certain requirements would seem to call for a load of 1,400 to 1,700 kW, the same result could be achieved with a load of 300 kW by careful consideration of the precise demands in the various apartments. He was in favour of continuous heating controlled by thermostats in preference to the employment of time switches for the purpose of switching on the current in the morning; in one particular case there was only a saving of £5 against the advantage of a uniform temperature, and an improved load factor.

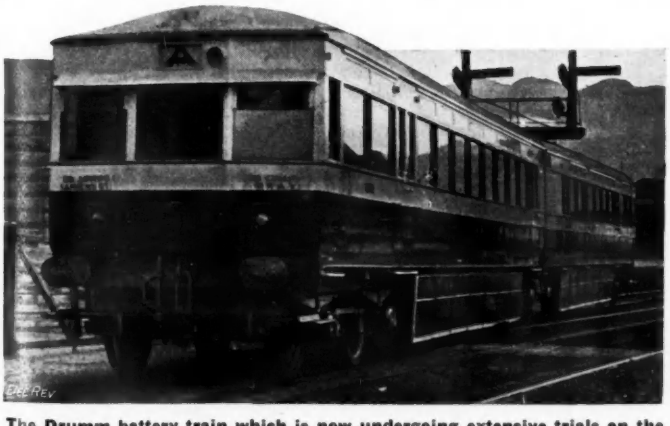
Continuous v. Intermittent Heating

Mr. G. W. Humphreys said that the method of analysis outlined in the paper should give highly successful results with continuous heating. In the case of intermittent heating, however, he thought that the system would be less successful. As the author had emphasised that many of his figures were pure assumptions it was difficult to feel that the accuracy of the conclusions was all that might be desired. He also indicated by calculations how an even better case for electricity could be made out for local heating, expressing doubt as to the 90 per cent. efficiency given for the gas fire. Moreover, there was the additional advantage of the portability of the electric fire. Dr. K. R. Sturley said the paper would give the layman the impression that electricity was of less benefit to him than gas, whereas if the installation costs were also taken into account an entirely different tale would be told. The public would use electricity or gas, according to which was the cheaper.

The Importance of Convection

Mr. J. Lesser (City of London Electric Lighting Co., Ltd.) said that it was the practical man who had "uneducated" Mr. Barker on the question of the thermal units, and the demonstration had been done without the aid of Mr. Barker's analysis. It would be done again and again until finally they would arrive at conclusions of a practical nature which would be a benefit to those who, after all, were charged with the job of warming buildings. He disputed the claim that buildings could be warmed only by radiation. In most instances it would be found that a judicious mixture of radiation and convection would give the desired result. An office building which, according to the methods of analysis usually adopted by heating engineers, was estimated to require 660 million thermal units for a season, was found by the method he was now advocating to require only 480 million thermal units—that was an illustration of enormous economy by using electricity for air convection. What were the physical dangers to life and property referred to, and were similar dangers, if any, not also present with any other form of heating? Not using time-switch control and leaving the heating installation in continuous operation would demand a much larger thermal consumption. Was there any inquiry as to the relative costs of gas and electricity for lighting? No, electricity was put in as a matter of course on account of its obvious general advantages, irrespective of cost, and the same would apply to the use of electricity for heating.

Mr. S. Rudd remarked that electricity could not be accepted as commercially competitive for continuous heating until it was possible to put forward sound reliable estimates of its cost as compared with other media. The paper indicated the many losses occurring in radiator hot-water heating, and also in coke, oil and gas installations, which, although suspected, had never been traced out before. The same kind of losses did not occur with electricity, which was practically unrestricted as to its range of temperature and of the positions in which it could be used. Moreover, such a convenient form



The Drumm battery train which is now undergoing extensive trials on the Dublin-Bray line (Photo by *Independent Newspapers*, Dublin)

of heating led to the heating season being extended by the use of electricity during cold spells in the summer.

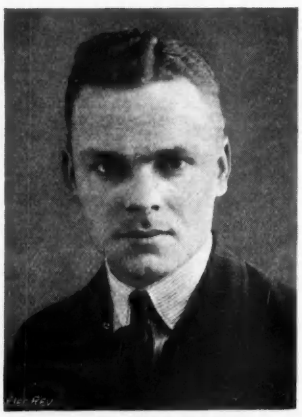
Results from an Actual Installation

Mr. R. E. Ashton, who spoke on behalf of Dr. Wingfield, complained that the paper had completely ignored the advantages to be gained by the application of automatic control to solid-fuel and oil-fired boilers. Mr. Fretwell called attention to the figures for heating the Murphy Radio Works. Thermal storage was employed, and with a space of 247,000 cu. ft. to be heated, and electricity at 0.4d. per kWh, the cost last season was £252, including testing, drying out, and warming the building. On the basis of a table given in the paper the cost would have been £833.

There was no time for Mr. Barker to reply to the discussion, but in a few comments he stressed that his tables were intended as a basis to be used in particular circumstances; actual figures for efficiencies, costs, &c., in any particular case could be substituted.

Electric Thermal Storage

THE paper read last week before the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS by Mr. J. Eden, provoked a discussion in the course of which Capt. A. C. Sparks (past branch president) said that on the Continent domestic electric water heating was catered for on business-like lines, by charging a definite figure per month or per quarter; it was known almost exactly how much power would be required for a boiler of a given capacity. Thus, the complexity of "unit" charges, measuring, and so on, were avoided, and the elimination of additional metering was a great advantage.



Mr. J. Eden, author of the paper on "Electrical Thermal Storage"

Mr. J. W. Macdonald said that although there were cases in which electrical thermal storage might be used with advantage, he did not think that the general heating of buildings would be effected by this method. It was subject to the same heat losses as were common to any system of heating by hot water. A considerable proportion of the heat was expended in heating parts of buildings which might not require to be heated, in order to obtain the necessary amount of heat at the points where it was required. The installation of such a system was expensive and, unless carefully done, the structure of the building might be damaged by channelling or making the ducts. The thermal storage system, operating at off-peak periods, necessitated larger cables and heavier switchgear than would be necessary for a direct-heating system, owing to the fact that the heat had to be put into the system within a short period. In his opinion electrical storage systems could best be utilised in existing hot-water installations for a number of reasons.

Reliability and Space Questions

Mr. C. M. Mayson said that for a medium-size installation, when the cost of electricity was not very different for the two systems, he would choose immersion heaters because if there were only one electrode boiler, the breakdown of a quartz insulator, for example, would mean that there would be no heat available until it was replaced; whereas if one immersion heater failed the decrease of temperature would hardly be noticeable. The question of finding sufficient space for the tanks was a serious one in many buildings, and might be a deterrent to the use of thermal storage, in London at any rate. Systems of this kind should be designed and put before the architect before a building was commenced. Mr. C. H. Roddis emphasised the importance in this country of having a method of varying the temperature as desired in accordance with the variations of air temperature. One could not maintain a plant of 10 million B.th.u. per day for £5 per year. It would cost as much as that to scale the units.

Very Low Tariffs Possible

Mr. J. W. Gibson (past-president of the Association) emphasised the convenience of thermal storage for buildings which were in intermittent use, such as offices, theatres, and churches.

Mr. Allen said that from the supply station engineers' point of view much could be done with thermal storage heating, particularly in industrial areas, where mains of very large capacity existed which were not required at night time. He considered it possible for several authorities to quote very low prices for thermal storage at off-peak hours (at about 10 per cent. upon coal cost). He knew of one immersion heater storage installation which had been in operation for nearly 2½ years and so far there had been no maintenance costs. The cubic content of the building was approximately 380,000 cu. ft. In the second year of operation the running cost was 0.324d. per cu. ft., which was quite satisfactory for a large office building. In the first year the running cost was about 0.45d. per cu. ft. because a good deal of heat was needed for drying out a new building. In the North of England, in very exposed situations, the cost was about ¼d. per cu. ft. per annum for heating. The most satisfactory and cheapest operation costs were achieved where the low temperature panel system was installed, owing to the fact that the maximum temperature of the water was usually about 120 deg. F., whereas in a radiator installation it was sometimes necessary to have a temperature as high as 180 deg. F. The tariff was 0.33d., less 5 per cent., for low-voltage supply and for the circulating pump motor a sliding-scale tariff which worked out at less than 1d. per kWh.

The Author's Reply

Mr. Eden, replying to the discussion, said that supply authorities were beginning to take a more general interest in these schemes, and were finding that they could supply electricity at low tariffs during off-peak hours. Where mains already existed they were quoting down to 0.25d. per kWh and some were considering 0.2d. He could not see that larger cables were required for thermal storage than for direct heating. There was a good field for automatic control and there was available a mixing valve with remote temperature control whereby, as the outside temperature dropped, the setting on the thermostat went up, and regulated the temperature of the water. These were closed systems, mineral or lime deposit would occur during the first few months of running and after the first cleaning there was no further deposit. In service there was very little scale because the water was circulated at a fairly high rate over the electrodes. In the case of immersion heaters the main deposit occurred at the hottest points, *i.e.*, on the immersion heater container tubes. Churches, cinemas, and theatres were probably best left to direct systems of heating, but one church had been equipped with thermal storage quite reasonably. With regard to central heating by thermal storage for domestic premises, the total value of the load did not warrant very low tariffs.

The Electrical Regulation of Street Traffic

IN opening a discussion on "Street Traffic Signals" at an informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS on December 5th, in London, Mr. E. S. Perrin said that street signals, which speeded up traffic and increased safety on the highways, now numbered 700 in the London area, and though experience of them was short they had undoubtedly been of the greatest service in co-ordinating the control of consecutive junctions in busy highways.

He showed charts and graphs of the various systems and the different methods of signalling; exhibited a working model of an electromagnetic traffic-operated signal; and described the three methods of actuating the lights in the signal standards as follows:—(*a*) *The synchronous*, by which traffic travels in blocks from pillar to pillar; (*b*) *the limited progressive*, by which the blocks give right of way in series; and (*c*) *the flexible progressive* system of signals sent on from one to another by a master controller, which can either shut down the system or govern the time of rotation, and ensures synchronism.

The vehicle-operated system illustrated by the model was warmly commended, but in Mr. Perrin's view insufficient experience was available to enable it to be decided which was the better, the time-operated or the traffic-operated system. With regard to the latter, the extra cost of the traffic detector pads, which had to be inserted in the roadway, as well as their limitation, had to be considered.

Mr. J. F. Shipley asked why it was usual to erect standards at four corners of a junction in England, while on the Continent and in the United States a central pillar or suspended signal was the practice? Mr. Perrin said that the United States had all systems in service, and his impression of New York was that four pillars were common, though the traffic problem there and on the Continent was by no means parallel to ours. The defect of overhanging lights was that they could not be seen from certain types of cars within a distance of twenty feet, though this defect was partly in evidence in the case of the pillars at the side of the road, when a large vehicle masked the signal for a small car. On the question of noise, it should be known that representations by residents near busy junctions called for the retention of signals all night, as they abolished warnings by motor-horns.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

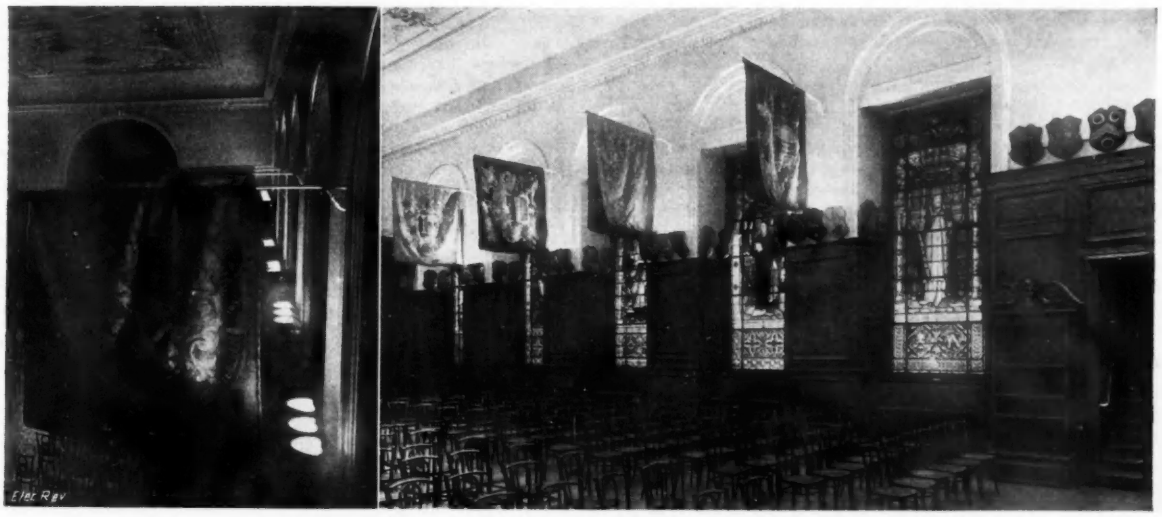
The Central Board's Tariff

The letter from Mr. W. Fennell in your issue of to-day's date and your own editorial comment upon it have given rise to a serious discussion in my office. Our interest arises from the fact that we are electrical installation contractors, anxious to obtain business whether for large or small work, and going out all the time for it. We find ourselves up against a very serious difficulty in that we are without information or data on which to advise prospective users of electricity regarding the cost with which they may expect to be faced after a full electrification of their undertakings. What we are short of is a plain and comprehensive statement of the charge to be made for electricity when it is obtained directly or indirectly, from the grid, and Mr. Fennell's suggestion for a deputation to wait upon the Central Electricity Board should be distinctly fruitful in this direction. It is therefore suggested that, in addition to representatives of bulk purchasers, representatives of ultimate consumers might be invited to join, with a view to finding out what the Board can say with regard to ultimate cost.

There can be no doubt whatever that the grid will be a very powerful factor in the future in causing industrial concerns to consider very seriously the establishment of factories in districts which at present are ruled out because there is no power available. Many concerns which are just not large enough to entertain the idea of installing their own generating plant would be glad of the assistance of electrical installation contractors to advise them as to what the possibilities of the grid really amount to. And as stated above, it comes down to this—given a specification of the machinery to be installed and operated, number of lights required, &c., what is our electricity consumption going to cost us *per unit*?

The contractor can supply the answer to every part of the problem except this, and it would seem that the Central Electricity Board should now begin to give attention to that aspect, the eventual result of its activities.

December 9th. COMPANY SECRETARY.



Effective lighting at the Stationers' Hall, London. (See note on page 906)

Rubber and Gutta Percha

In the third column of Mr. Middleton's article in your issue of November 25th the following paragraph appears:—"When crude or vulcanised rubber is immersed in distilled water, or exposed to atmosphere saturated with water-vapour, a progressive absorption takes place which gives no evidence of ultimately reaching a state of equilibrium. With a three per cent. salt solution, however, a month's immersion will suffice to produce a condition when no more absorption occurs—rarely above a moisture-content of three per cent."

The author then refers to graphs showing the electrical behaviour of a commercial grade of vulcanised rubber when immersed in tap water at an unrecorded temperature. As the subject under discussion is the behaviour of submarine cable insulation, presumably in salt water, the value of the information to be derived from the graphs is not obvious in this connection. If graphs had been obtained showing the influence of immersion in sea water at a temperature between 40 deg. F. and 50 deg. F. on a vulcanised rubber designed for the purpose of submarine cable insulation, it is possible that the author's conclusions would be less opposed to those appearing in the publication of the American Bureau of Standards than seems to be the case at present.

I have no intention of entering into a discussion of the respective merits of gutta percha and vulcanised india rubber as insulators for submarine cables, but the following information regarding rubber submarine core may be of interest to Mr. Middleton. During the period 1868/1871 some 2,700 nautical miles of "Hooper's Core" was used in cables manufactured and laid for one telegraph company. In the year 1919 more than 1,300 nautical miles of this core was still in service, either under the original armouring or under renewed armouring—some of the latter having been spliced into gutta percha cables during repairs. In all, over 900 nautical miles of the original core was re-armoured under the testing and supervision of the telegraph company's electricians and engineers. The last delivery of this re-armoured core was made in 1920—fifty years after the core had been manufactured.

Other instances showing the extent to which this type of vulcanised rubber core retains its electrical and physical properties under submarine conditions could be given, but it is probably more to the point to note that a considerable amount of submarine cable with rubber insulation is in use at the present time, and that such cables continue to be manufactured, my own company having supplied four telegraph companies with more than 2,000 nautical miles of core of the original type during the last twelve years, the most recent shipment having been made in July last. J. F. W. HOOPER.

(Hooper's Telegraph & India Rubber Works, Ltd.).

London, E.C.4, *December 10th.*

The Patent Position

Mr. Runciman, the President of the Board of Trade, speaking before the Society of Auctioneers recently, remarked that one first-rate invention was worth fifty Acts of Parliament, and commended invention as one of the elements which would contribute to the return of British prosperity.

Is any help for inventors, or relief from the burdens placed specially upon them, to be hoped for as a result of this pronouncement? In the meantime, what has happened is that the first cost of completing a patent has been raised from £3 to £4. Inventors frequently find great difficulty in paying the fees charged for the registration and renewal of patents; only 6.3 per cent. of the patents taken out in this country reach their maturity of sixteen years of life. Most of them are taxed to death at an early age. The registration and renewal fees payable to the Patent Office, and covering England, Scotland, Wales, and the North of Ireland only, amount during the life of the patent to £130. Fees for professional assistance or advice are in addition to this figure.

The total cost in the United States for registration fees for a life of seventeen years is £7, paid down in advance, the worrying system of annuities being non-existent there. Why should an author be protected by the law of copyright for forty-two years at a nominal cost, while an inventor is deprived

of his property in an invention if he fails to produce the "brain-tax" at the end of any year? The Treasury extracts from the inventors of this country an annual tribute of something over £150,000 a year, whereas millions might accrue from income tax resulting from the encouragement of invention.

In America the £7 registration fee secures protection in all the States of the Union, whereas the protection of a patent throughout the British Empire would cost a colossal sum, and is seldom attempted by any inventor, rich or poor. Is it too much to hope that, in the present wave of enthusiasm for united Empire trading, something may be done to provide a common patent law for the whole of the Empire, and at a cost comparable with that in the U.S.A.?

It is an interesting fact that almost exactly one hundred years ago *The Times* in an article used the following words: "If you are an inventor whom the iniquitous and oppressive tax on patents shuts out from the field of fair competition, and are desirous of seeing that tax removed—go and vote for Mr. Babbage."

The damage done to progress in this country during the hundred years since that article was written is incalculable, while the benefit to the revenue resulting from the policy of the Treasury over the whole hundred years is contemptible.

Caterham, *December 9th.* G. WATSON.

The I.E.E. Regulations

Replying to the first paragraph of "Regulator's" letter in your issue of December 2nd I am fully aware of West Ham's peculiar powers in respect of these regulations, but the point particularly stressed is a matter of Common Law, *i.e.*, the party concerned is asked to sign an agreement which distinctly states that he or she is prepared to accept the I.E.E. Regulations.

Now, can the authority take a consumer to law for not complying with this obligation? It is a delicate question and not so easily answered, because in a large number of cases the wiring contractor works to the instruction of the builder and has left the neighbourhood before the house is taken over by a prospective purchaser. The question, of course, ignores the scope of the B.O.T. Regulations as these are obvious.

In "Regulator's" second paragraph he refers generally to trouble in the home. May I remind him that the case quoted was a hairdresser's establishment with water taps adjacent to electrical apparatus and a composition floor. This particular case is, in my opinion, very important because direct shock to the customer or an assistant may lead to an inquest and a bad "advertisement" for electricity.

"Regulator's" statement regarding the authorities and their "multiplicity of regulations" is rather misleading, and as a supply engineer engaged in consumers' work I cannot let that wording go unchallenged because the various companies' rules nearly all request, in effect, that the B.O.T. and I.E.E. Regulations shall be adhered to where possible. Various requests for particular types of starting gear for certain classes of motor are surely a technical problem for each individual distributing system and do not affect the main issue, which is a discussion of those rules directly affecting public safety, which, surely, was the paramount thought in the I.E.E. Committee's mind when these regulations were compiled. CURIOUS.

December 12th.

Indeed!

The courtesy extended by you to correspondents in publishing such opinions as those expressed by Mr. R. W. L. Hamilton in your issue of December 2nd is a matter for congratulation. Generally, any criticism of that sacred occupation known as "publicity" is quietly smothered at birth. The selection of the heading, unfortunately, does not, however, indicate strict neutrality.

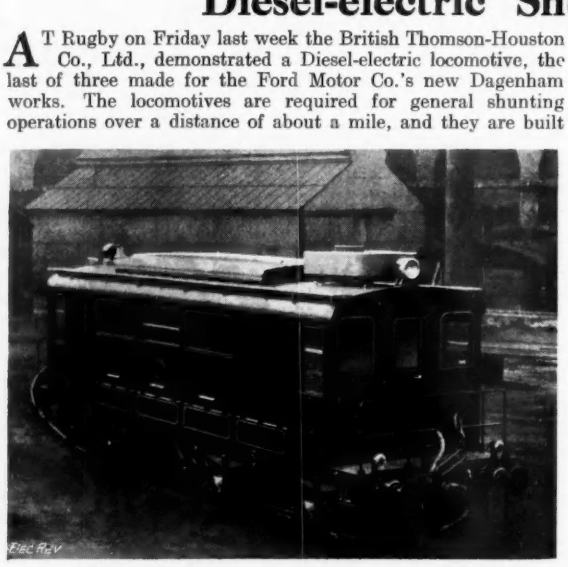
Not long ago the impracticability of the "cooker campaign" was illustrated by the butcher who remonstrated with a lady demonstrator for purchasing the best and most expensive joints for educational purposes. He contended that the scholars at the school would never handle that class of meat at home, as it was beyond the purses of their parents; they ought to be taught to make the humble joint palatable.

Some are so keen on the development of electrical energy that it obscures their vision, and warps their judgment of what is desirable for the nation as a whole, and it is a pity that such one-sided views should exist. L. E. WILSON.

Manchester, *December 3rd.*

Diesel-electric Shunting Locomotives

AT Rugby on Friday last week the British Thomson-Houston Co., Ltd., demonstrated a Diesel-electric locomotive, the last of three made for the Ford Motor Co.'s new Dagenham works. The locomotives are required for general shunting operations over a distance of about a mile, and they are built



The B.T.-H. Diesel-electric shunting locomotive

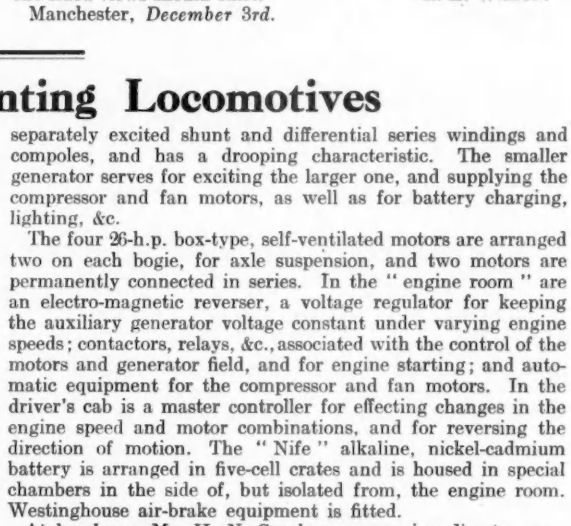
to comply with the L.M.S. loading gauge. Each, complete with fuel, weighs 44 tons—11 tons on each driving axle.

The nominal engine output is 150 h.p., and the maximum tractive effort is 24,000 lb.; the continuous rating is six m.p.h., and the maximum safe speed is 35 m.p.h. The overall dimensions are 38 ft. 6 in. long, 8 ft. 9 in. wide and 13 ft. 3 in. high on the centre line. The fuel consumption is 1½ to 1¾ gal. per hour, or 250 to 300 ton-miles per gallon. The all-steel frame and body-work were manufactured by the Metropolitan-Vickers Electrical Co., Ltd. The six-cylinder, four-stroke, airless-injection "Allen" engine is rated at 150 h.p. (550 r.p.m.) continuously, and was described in the ELECTRICAL REVIEW of June 24th.

The electrical equipment is of B.T.-H. manufacture. Coupled directly to the engine are the 95-kW main and 15-kW auxiliary generators. The main machine is compound wound, with separately excited shunt and differential series windings and compoles, and has a drooping characteristic. The smaller generator serves for exciting the larger one, and supplying the compressor and fan motors, as well as for battery charging, lighting, &c.

The four 26-h.p. box-type, self-ventilated motors are arranged two on each bogie, for axle suspension, and two motors are permanently connected in series. In the "engine room" are an electro-magnetic reverser, a voltage regulator for keeping the auxiliary generator voltage constant under varying engine speeds; contactors, relays, &c., associated with the control of the motors and generator field, and for engine starting; and automatic equipment for the compressor and fan motors. In the driver's cab is a master controller for effecting changes in the engine speed and motor combinations, and for reversing the direction of motion. The "Nife" alkaline, nickel-cadmium battery is arranged in five-cell crates and is housed in special chambers in the side of, but isolated from, the engine room. Westinghouse air-brake equipment is fitted.

At luncheon, Mr. H. N. Sporborg, managing director, emphasised his company's advocacy of the Diesel-electric locomotive for "special purposes" and not for general railway train propulsion.



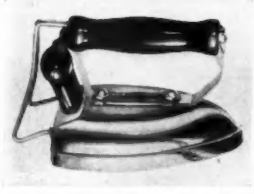
The 150-h.p. "Allen" engine and B.T.-H. generator

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A New " Sunco " Iron

The principal advantages of the new " Sunco " iron over its predecessors are due to the incorporation of an element of the improved " Chromalox " pattern, giving the maximum heat at the toe and heel of the iron, and a new type of side entry moulded " Bakelite " connector which can be supplied with an earthing terminal.



The new " Sunco " iron

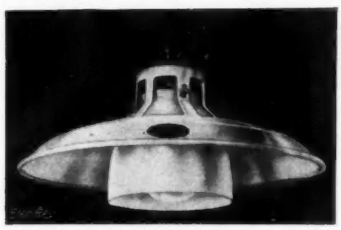
The connector guard has also been redesigned and three yards of flexible cord is now given. The new model is priced at 10s. 9d. nickel plated, 11s. 9d. enamelled, and 13s. 9d. chromium plated, and is supplied by the SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, W.C.2.

The " Nivex " Temperature Recorder

The " Nivex " temperature recorder, a product of the NIVEX INSTRUMENT & GAUGE CO., 3, Furlong Road, Holloway Road, N.7, is designed for clamping to hot water or steam pipes. Both Fahrenheit and Centigrade readings are available, and an indicating finger showing the rise and fall can be supplied if required. The standard model is priced at 15s. and the desk model, finished in " Bakelite," at 21s.

A Domestic Lighting Fitting

A domestic lighting fitting, which can be fitted by any housewife, and which is packed in an attractive carton ready to hand over the counter, satisfies a long-felt need. The " Benflux," manufactured by the BENJAMIN ELECTRIC, LTD., Tottenham, is such a unit. The carton in which it is sold measures about 12 in. square by 8 in. deep. There are no loose parts to stock and no wireman is required to install it. The actual fitting, which is graceful and attractive in appearance, consists of a metal reflector vitreous enamelled white and a diffusing glass shade. It is easy to keep clean, and in each carton is a free tin of Benjamin reflector cleaner. The retail price of the " Benflux " unit, which is illustrated above, is 12s. 9d.



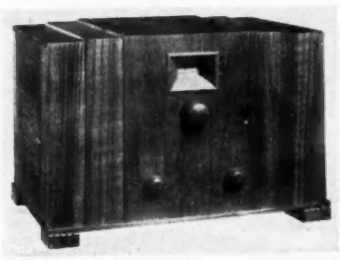
The " Benflux " lighting unit

An A.C. Superheterodyne Set

Selectivity is the most pressing problem confronting the designer of radio receivers to-day. Of the range of G.E.C. radio sets, the B.C.3358 a.c. mains receiver is one of the most effective in this direction, for it is constructed upon the supersonic heterodyne principle. Only a short aerial is necessary. The set is fitted in a walnut cabinet and is equipped with an automatic station index.

The wavelength range is 200/550 and 900/2,000 metres, and it is designed for use on mains of 100/150 V and 200/250 V (at all frequencies between 40 and 80 cycles). The total loading is 70 W, and the undistorted output of the set is approximately 2½ W, a.c.

The first valve is coupled to the aerial by a tuned pre-selector in the form of a band-pass filter. Rectification takes place in the anode of the h.f. valve, at which point the oscillator feed is also injected. In this manner the feedback of the oscillator to the aerial circuit is much reduced. A single stage of intermediate frequency amplification follows. This employs a variable-mu screen grid valve, and incorporates two band-pass units accurately adjusted, thus ensuring a high degree of selectivity. The second detector is of the screen-grid variety, and is resistance-capacity coupled to the power pentode output valve. Care has been taken with the oscillator design to maintain efficiency with freedom from harmonics. Decoupling and smoothing are generous, and intermediate frequency amplification is carried out at a frequency of approximately 107 kc.



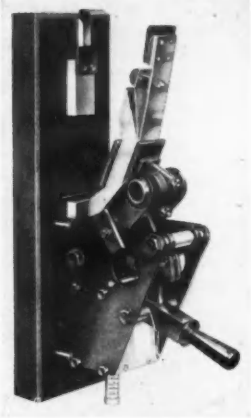
" Gecophone " superhet. mains receiver

By an arrangement of padding condensers accurately adjusted, the oscillator tuning condenser is tracked correctly for both long and short waves and true one-knob control is obtained. The main tuning control actuates a triple gang tuning condenser, and the range switch automatically adjusts the station index.

Sockets are provided for external aerial and earth, for external loudspeaker, and gramophone pick-up as well as for mains aerial. A mains energised " Gecophone " moving-coil speaker is provided. The weight of the receiver is 46½lb. net; its dimensions are, height 19½ in., width 17½ in., depth 13 in. The price is 26 guineas.

A Robust Circuit Breaker

A new line of circuit breaker for from 150 to 3,000 A at 650 V has been developed by WALTER'S ELECTRICAL MANUFACTURING CO., LTD., Kensal Road, London, especially for situations where considerable vibration or rough usage is experienced. Apart from the current-carrying parts, the new " Wemco " breakers are constructed entirely of steel, which makes for lightness as well as strength. We found during a recent inspection of the switch that the amount of effort required for operation was unusually small, owing to the design of the double-toggle action, but it is claimed that the switch will not trip due to shock or vibration. The switch is loose-handled and will trip electromagnetically in all positions or by hand. On opening, the shock is absorbed by a steel pin in the moving arm which slides into slots *via* hardened steel plates held in position by springs on each side. There are no catches to wear out.



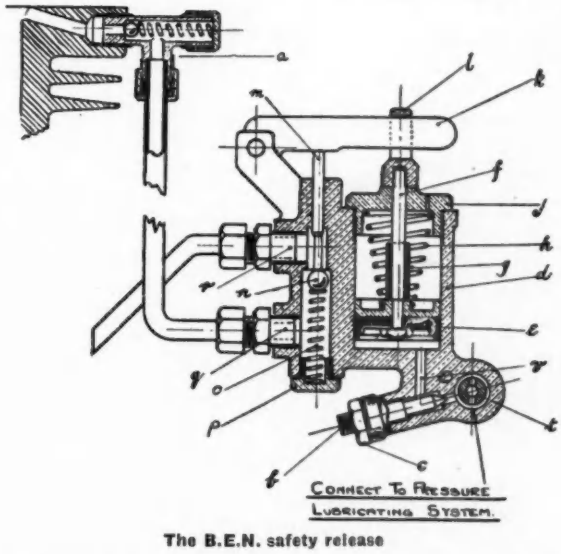
A " Wemco " circuit breaker

The main brushes are definitely aligned and are designed for a current density of 200 A per sq. in.; the maximum pressure drop allowed on test is 3 mV per brush contact at full load. The coils are of h.d. copper bar wound on formers. Normal calibration is from 75 per cent. of full load to 100 per cent. overload. The breakers are supplied for the usual combinations of overload, no-volt, reverse-current protection, &c., and may be either of the metal-enclosed or open type.

A Safety Release for Compressors

The new B.E.N. " Oilmatic " safety release is a device designed to unload positively a compressor when stationary and to hold the machine unloaded until full speed running is attained if the pressure lubricating system should fail due either to an obstruction or to shortage of oil.

The release is attached to the crank case of the compressor at the main lubricating oil duct, so that oil pressure is communicated at point (*t*). Oil pressure is established through duct (*v*) to the underside of the piston or plunger (*e*), the rate of flow of oil being regulated by the needle valve (*b*). The plunger is raised against the pressure of the spring (*h*) carrying upwards the lever (*k*). The air release ball (*n*) is then free to seat, assisted partly by spring (*o*) and the pressure of air from the compressor head. The air inlet (*q*) must be connected



The B.E.N. safety release

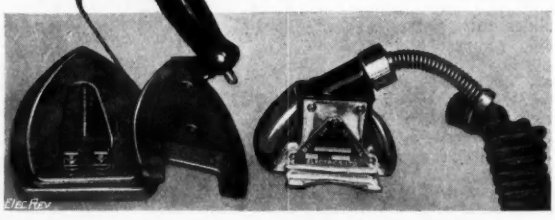
by a ¼-in. bore copper pipe to the underside of the valves in the compressor head; thus the delivery-valve plate serves as a check or non-return valve in preventing the escape of air from the receiver when the compressor is in the stationary and unloaded position. No other check valve is necessary between the delivery pipe of the compressor and the receiver. The oil restrictor needle (*b*) is adjustable, to give a very large variation in the rate of flow of oil to and from the plunger (*e*); thus either a quick or a delayed action is imparted to the plunger yoke (*l*) thereby allowing the unloaded period between "start" and "full speed" to be adjusted to suit the characteristics of the motor in use.

For motors of 1 to 3 h.p., either a.c. or d.c., a delay of 5 seconds between the opening and closing of the release ball (*n*) is ample for all normal conditions of service; for larger motors which have starters incorporating several steps of resistance a delay of 5 to 10 seconds can be readily obtained. The non-return ball valve (*a*) fitted to the compressor cylinder flange serves to retain compressed air in the release pipe at a balanced pressure to that being delivered into the receiver whilst the compressor is pumping. The efficiency of the compressor is unaffected by the alternative compression and expansion of the volume of air contained in this pipe at each stroke of the piston which would take place if the ball valve were not fitted. The release is made by B.E.N. PATENTS, LTD., 92, Tottenham Court Road, W.1.

The "British National" Iron

In the new iron which BRITISH NATIONAL ELECTRICS, LTD., Mossend, Lanarkshire, has produced, a fixed cord grip connector is provided which prevents strain being transmitted to the terminals of the iron and prevents the disconnection of the iron by pulling the connector out. A ventilation slit prevents the heat being transmitted from the iron to the connector.

The "British National" iron

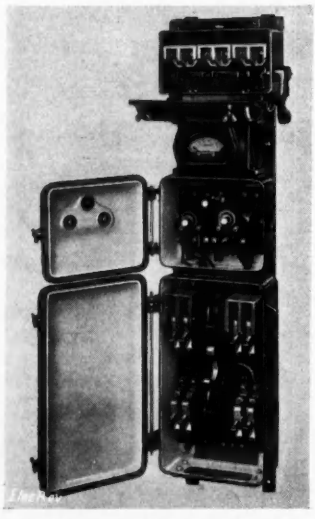


The iron may be taken to pieces by simply unscrewing the two nuts which secure the handle. The connection from the connector to the element is made by spring pressure between two nickel-plated contacts shown in the illustration. The 450-W "Chromalox" element can thus be easily replaced. The iron may be obtained weighing 5 or 5½ lb. for 12s. 6d., nickel-plated, or 15s. with chromium finish.

Automatic Direct-to-line Starters

A comprehensive range of small contactor starters for starting 2- or 3-phase squirrel-cage motors by connecting them direct to the supply by the pressure of a push-button is manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. The starters are suitable for motors ranging from ½ to 30 h.p. at voltages up to 550, and are available in two types, one for non-reversing service, which has already been described, and the other for reversing duty.

The reversing-type starter comprises two four-pole contactors which are mounted on a "Sindanyo" panel and housed in a black enamelled cast-iron case fitted with a hinged cover. The forward and reverse contactors are mechanically interlocked so that it is impossible for them both to close at the same time. Any risk of damage due to arcing when the contactors open under heavy overloads is entirely eliminated by moulded arc chutes, which are made from special incombustible material.



G.E.C. reversing-type, direct-to-line starter

Push-buttons for "start," "stop" and "reverse" are enclosed in a separate cast-iron box, together with three time-limit overloads, which afford protection on all three phases, so that in the event of a fault the motor cannot continue to operate on a single phase. The overloads are of the hand-resetting type, resetting being effected by pressing the "stop" push-button. The case which houses the push-buttons may be mounted immediately above the starter to form a complete unit, or it may be fixed in any convenient position for the operator. Push-button control from one or more remote points can be employed. Openings at the top and bottom of the case provide ready access for connections, and are covered by sheet-metal plates which are drilled for conduit and fitted with wood bushes.

A particular feature of both the reversing and non-reversing starters is the ease with which complete control panels can be built up. Panels which incorporate starters of the reversing type may include push-button controls, an ammeter and an ironclad isolating switch or any desired combination of these components. In starters of the non-reversing type the push-buttons are incorporated in the starter itself, but complete control panels can readily be assembled to incorporate an ammeter and an ironclad isolating switch.

An Imitation Coal Fire

In the latest addition to the Premier range of fires—the "Grafton"—the effect of burning coal is produced by a new principle, the representation of smoke and flames moving upwards across the full width of the fire.

The "coals" are moulded from "Bakelite," each piece being mounted on a metal frame to form a single unit which fits easily into the fire grate and has a pleasingly natural appearance. The lamp giving the smoke and flame effect can be switched independently of the fire bars; it is mounted between specially shaped chromium-plated reflectors and allows easy removal for cleaning or replacement.

The Premier "Grafton" fire

The new model has two switches giving three heats with loadings of 750 W, 1,500 W, or 2,250 W, and the price is £6 10s., finished in antique brass or copper, oxidised silver finish costing 15s. more. The overall size is 19⅝ in. high by 20½ in. wide by 9¾ in. deep, and the weight is 30 lb. The heating capacity is claimed by the manufacturers, PREMIER ELECTRIC HEATERS, LTD., Keeley Street, Birmingham, to be about 2,250 cu. ft.

An Automatic Tea Maker

An ingenious apparatus known as the "Teesmade" is now available for £4 15s. which, when set to a certain time, will boil water, infuse the tea, switch on a table lamp and ring an alarm. It is obtainable from MESSRS. DRAKE & GORHAM WHOLESALE, 77, Long Acre, W.C.2, and the set includes a small table lamp with a parchment shade; a square 2½-pint copper boiler, tinned inside, plated on the outside, and heated by a 700-W immersion type element; a removable clock with a plated front, and silver dial with black figuring; and a teapot and service in Burslem porcelain.

The lamp can be used independently of the set, and although it is designed essentially for early morning tea, it can be used to heat any liquid at a predetermined time and will give audible warning when it is ready. Several finishes, both for the wood and china are available, and the sets are made for 100/115-V and 200/250-V supplies. A bedside cabinet fitted with a drawleaf to accommodate the lamp standard, can be supplied for 25s. The manufacturers are Automatic Utilities, Ltd., 134, Uxbridge Road, Hanwell, W.7.

The "Teesmade" outfit

The "Univise" Connector

The "Univise" connector which we described in our issue of November 18th is marketed in England by MESSRS. HORRELL'S, LTD., 554-558, Grand Buildings, Trafalgar Square, W.C.2. The makers inform us that the half-jaw piece is not threaded, as was stated in the description.

Engineers as Managers? By H. N. Munro, F.I.I.A.

EVERY now and again the question is asked whether engineers should learn to become administrators or whether the non-technical man should assume responsibility and take over the reins of authority. And just as often comes the reply about the cobbler sticking to his last, although each time the reply gets weaker until it has become only the plaintive bleat of those grown hoary in the service of science.

When one comes to examine the training, scholastic and practical, of the engineer, it is amazing how unconscionable a time in dying is his belief in his aloofness and superiority. From the moment when his education develops along planned lines to the day when he faces the drawing board for the first time, he is confronted with problems which are essentially practical and which call an analytical and balanced mind to their solution, and as he follows his course further towards its end these problems become even more practical and must invariably demand no small degree of commercial intelligence if they are to be successfully surmounted.

Is it because the engineer lacks commercial intelligence that he has so long allowed others of inferior education and training to usurp his higher responsibilities, or is there something traditional in his objection to, or, shall we say, distaste for, things commercial? To suggest that his mental equipment is such that it will not absorb things of merely mundane moment is a libel which will deservedly be resented, but to insinuate that tradition holds him in thrall would be very near the truth, particularly when one hears the mutterings in the beards of those aged ones whose technical attainments we do honour, but whose lack of industrial foresight we might regret. It might, of course, be pure altruism on the part of engineers, who, laying the foundations of successful enterprises, are content to allow others to reap the financial reward, asking only that they shall be vouchsafed a niche in the hall of technical fame. But we think not: engineers are but human!

Education and Training—The Difference

It is a great thing to know that the professional institutions are embodying in their examination syllabuses the subjects which, scant as they are, do suggest that the engineer of the future will be able to take his place in the board room as an administrator as well as a technical executive, and the reports which we occasionally hear about business administration courses in such places as London, Dundee and Manchester give us hope that every technical educational centre will put education for management in its curriculum, for we are far behind Germany and America in this respect.

But education for management and training for management are very different things. The former, at its best, can only be general and can only be expected to provide a foundation on which the fabric of the more practical kind can be built up, but on the strength of that foundation will depend what kind of structure can be carried later on. Training for management, on the other hand, is the transition stage from the state of embryo to that of the fully fledged administrator, and it must be essentially practical and along more specialised lines than the earlier educational process will permit.

That the young engineer is becoming more conscious of the opportunities which management holds later on in his career is evident from the growing number of technical schools and colleges where the elements of administration form part of the educational syllabus, but that these schools are themselves not quite aware of the requirements of the industry, or the problems of management, is obvious from the lack of sound and solid practical instruction and the unco-ordinated teaching which results. This is more the fault of industry than of education, since industry has not yet said in a certain voice just what it requires from the aspirants to administrative responsibility, and it is not too much to say that it does not know itself just what qualifications and knowledge should be possessed by those who are to be responsible for its governance. Inevitably the time must come in the experience of almost any engineer when he is called upon to make a decision which will confine him to the comparatively narrow path of technics or will allow him the greater freedom and bolder life of business leadership.

The Qualifications are There

There are many, of course, whose bent is essentially in the direction of research and experiment, but the greater number will, it is hoped, realise the importance of some retention of control over their own industry and will not ignore the possibilities which are open to men of the right calibre.

It is clear from an examination of those qualities which we look for in the higher ranks of administrators that the engineer is eminently a suitable person to hold a responsible administrative position. Personality is a decided asset, and it cannot be said that engineers are lacking in that quality, or that accountants, sales managers and others who are taking some of the big jobs in the engineering industry are blessed with an ego which is denied their technical brethren. The ability to plan and budget, to think ahead and to organise is surely something which the engineer, with his analytical mind and his training based on facing facts squarely, ought to possess in marked degree. He is accustomed to looking at things from the practical perspective, to weighing carefully the pros and cons and to eliminating the fortuitous and the doubtful from his considerations. There is nothing in the qualities and requirements of an administrator that a good engineer cannot fill. All that he needs is to be weaned in his young days from the bottle of tradition.

If, during his education, he is taught the fundamentals of business management he will grow up in sympathy with the management functions and will attain, in the natural course, to the control of activities outside of, but intimately connected with, his own special function as a technician.

The colour lighting in the lounge of the White Star liner *Georgic* is effected by means of a special Holophane amber-coloured lighting trough which employs only one lamp in every 3-ft. run. The installation was carried out by Messrs. Heaton, Tabb & Co., London

Those responsible for technical education must recognise in the growing demand for capable administrators the great chance which the engineering student has, not only in making his own position more secure in later years, but in maintaining the high status which engineers hold in industry—a status which will not be enhanced by the incursion into engineering businesses of controllers who are ignorant of, and out of sympathy with, the whole outlook of the technical man.

Insight into Administration

The subjects treated in educational courses should permit of elastic and broad treatment, but their force will be lost during the first few years of the engineer's work or practical training, unless industry takes him in hand and leads him through some administrative experience during that time. Some big engineering concerns allow their young engineers to gain early some experience in the non-technical departments, and it ought to be a fairly easy matter for most firms so to encourage administrative ability in their technical staffs. Even if an engineer remains a technical executive, it is to the advantage of all concerned that he should be able to discuss, say, new designs in the light of costing experience, with a knowledge of market values and possibilities, and of financial and budgeting worth.

However indispensable the services of the engineer are in industrial activities, the fact remains that it is on demand alone which the work of his brain and hands can assume any value, and while he allows others to exploit the commercial possibilities of his products, so must he lose the reward which, base lucre though it may be, is after all the consideration for which most of us are compelled to strive.

Unauthorised Interference. By J. W. Simpson, A.I.S.A., Secretary I.M.E.A.

THE tampering with apparatus on consumers' premises is a matter which calls for attention. Clause 18 of the Electric Lighting Act, 1882, states, *inter alia*: "No person shall be at liberty to use electricity supply, or to deal with it in any manner so as to interfere with the supply of electricity to any other person." Clause 28 of the Electric Lighting (Clauses) Act, 1899, says that the consumer is to state the maximum power he requires and that he shall not be entitled

Mr. Jack Payne and his band recently paid a visit to the Hollinwood works of Messrs. Ferranti, Ltd. The picture shows Mr. Payne playing the saxophone with Mrs. Payne at the piano. Mr. D. Z. Ferranti is on the right

to alter that maximum except upon one month's notice to the undertakers.

Clause 18 of the Gasworks (Clauses) Act, 1847, which is incorporated with the 1887 Act, covers theft or fraudulent use of electricity. Under the Common Law, the breaking of seals by unauthorised persons is a punishable offence.

There does not, however, appear to be any general provision in the Electric Lighting Acts making it an offence to interfere with the lines or apparatus of the undertakers on consumers' premises, though there are several provisions dealing with specific acts and making them punishable offences. A consolidation of the provisions as to interference with, and damage to, the works of the undertakers would effect a great improvement. Sections 18, 19 and 20 of the Gasworks (Clauses) Act, 1847, and Section 38 of the Gasworks (Clauses) Act, 1871 (which are incorporated with the Electric Lighting Act, 1882), cover practically all cases of damage to the lines and apparatus of the undertakers.

With regard to the difficulty experienced with contractors and consumers through the insertion of fuses or the increasing of the size of existing fuses in the cut-outs of supply authorities, there are two sections to which resort might be had, viz., Section 18 of the Gasworks (Clauses) Act, 1847, and Section 53 of the Electric Lighting (Clauses) Act, 1899, in the amended form enacted by Section 11 and the Second Schedule of the Electric Lighting Act, 1909. The former of these provisions has a wide application in view of the decision in Wood *v.* West Ham Gas Co. (1885-52 L.T. 817; 1 T.L.R. 558), and in the cases of alteration of fuses which may not come within that provision, Section 53 of the Act of 1899 would appear to apply in all cases where the supply is by meter (as is generally the case).

Where there is already a supply of electric current, it is impossible to substitute another fuse for the existing one without first disconnecting the latter from the electric lines, and then connecting the lines to the new fuse, thus committing two offences against Section 53. The weakness of this Section lies in the fact that the prohibition is only for forty-eight hours after notice to the undertakers; still, that time is fairly ample to enable the undertakers to ascertain what is proposed to be done and to take the necessary steps to prevent any interference with their apparatus. The Section again only refers to "the consumer," but in view of the decisions in cases where such points have arisen, it may safely be assumed that any person acting on behalf of a consumer who does not act in contravention of the Section would be held to be guilty of an offence against the Section.

Responsibility for Electrical Accidents. By A LEGAL CORRESPONDENT

The position of power station engineers

THE recent summons against the Darlington Corporation (reported in last week's issue) under the Factory and Workshop Act, 1901, had certain unusual features on account of the fact that the Corporation, summoned as the occupier, itself proceeded under Section 141 of that Act against a member of its staff who was on duty at the time of the accident and who, the Corporation alleged, was responsible for the breach of the regulations. The accident was admittedly due to an error on the part of the charge engineer. He had intimated to a contractor's employé that a high voltage cubicle was safe to work in. The cubicle was in fact alive, with the result that the employé in question came into contact with a live isolator and sustained a shock and burns, though without fatal consequences. There was clearly a technical breach of the Electricity Regulations and the factory inspector was justified in taking out a summons against the occupier.

It is provided, however, by Section 141 of the Act that where the occupier of a factory or workshop is charged with an offence against the Act he shall be entitled to have any other person whom he charges as the actual offender brought before the Court at the time appointed for hearing the charge and if, after the commission of the offence has been proved, the occupier proves to the satisfaction of the Court, (a) that he has used due diligence to enforce the Act, and (b) that the other person had committed the offence without his knowledge, consent or connivance, that other person shall be summarily convicted of the offence and the occupier shall be exempt from any fine. The person so convicted shall also be liable to pay any costs incident to the proceedings. The Corporation proceeded under this provision and took out a summons against the charge engineer.

"Due Diligence"

At the hearing before the magistrates, counsel for the prosecution intimated that he intended to proceed on one summons only, *viz.*, for breach of Regulation No. 18 (d), which provides that when work has to be done on any switchboard not so arranged as to secure that the work may be carried out without danger, it shall be made dead, &c. The Town Clerk intimated for the Corporation that he proposed to proceed on a similar summons against the charge engineer. Both were taken together for the sake of convenience, though, strictly speaking, the summons against the charge engineer was not effective until the offence for which the Corporation was charged had been proved. The hearing had, in fact, to proceed by stages. The prosecution had first to establish that an offence had been committed and then the burden was thrown on to the Corporation of proving that it had used due diligence to enforce the regulations, and that the charge engineer had committed the offence without its knowledge, consent or connivance.

Observance of the Regulations

The object of Section 141 is to enable the occupier to obtain exemption from a penalty where he can show that he himself was not responsible for the offence. Generally speaking, this is not an easy task in the case of an electricity undertaking which obviously can only act through its servants. The law will not allow an occupier to hide behind his employés, or to shift the responsibility for a breach of the Factory Acts on to them, unless he can establish that he has done all that could reasonably be expected of him to see that the regulations were observed. It is not sufficient for him merely to show that he has ordered his employés to observe the regulations, he must prove that he has used due diligence to see that they are carried out, *e.g.*, that he has given instructions as to how the regulations are to be observed and has taken every precaution to prevent a breach. In this connection he may have to prove that switchgear has been so arranged that so far as possible the risks of accidents are reduced to a minimum, that interlocking devices have been introduced where practicable and systems of checking adopted so as to eliminate as far as possible the chances of human error. Even the most cautious and conscientious employé is liable to make a slip, to forget an important operation or to overlook a possible safeguard.

In the Darlington case it was stated by certain of the witnesses that if there had been a system in operation on the undertaking whereby the authorised person was required to sign a card certifying that the apparatus was dead, as is the case in some undertakings, the accident would probably have

been avoided. It does not follow that failure to use such a system amounts to a lack of diligence, and in the Darlington case the bench implied by its decision that it adopted this view. Nevertheless it is not wise to under-estimate the value of precautions of this kind.

When is the Procedure Justified?

One point of importance which emerges from this case is as to the expediency of electricity undertakers adopting the procedure under Section 141. One can appreciate, of course, the attitude of the Corporation: it was anxious to prevent any stigma attaching to it as a result of an accident which was due almost entirely, if not completely, to the failure of the human element.

There were admittedly none of the doubtful features in this case which have characterised previous recent prosecutions where an accident has occurred, not owing to inadvertence but because men have been allowed to work under circumstances where there was an element of risk. But even in these cases it might have been argued that a member of the staff was responsible and that the undertaker by appointing a competent person had done all that could reasonably be expected.

One can visualise some rather hard cases arising if undertakers adopt this line, and it might possibly have the opposite effect to that intended. Instead of making officials as careful as they ought to be and as most of them are, it might make them nervous, not to say dissatisfied, by the prospect that if they make a mistake they may not only be dealt with in a disciplinary fashion by the undertaker but may be hailed before magistrates and be ordered to pay towards the cost of a prosecution. One may venture to submit that an undertaker is only justified in proceeding against a member of the staff if there has been gross carelessness, negligence, or wilful misconduct on his part as the result of which an accident has occurred.

Incidentally, the factory inspector has himself powers under Section 141 s.s.2 to proceed against the actual offender instead of the occupier if he is satisfied at the time of the discovery of the offence that the occupier of the factory had used due diligence and that the offence had been committed without his knowledge, consent, or connivance. It is not without significance that in the Darlington case the factory inspector did not proceed against the charge engineer, and one can only presume that at the time he was not satisfied with regard to the diligence shown by the Corporation.

In the Courts

IN the Chancery Division on December 12th Mr. Justice Farwell heard a motion on behalf of the Mullard Radio Valve Co., Ltd., for an interim injunction to restrain until the trial, or further order, C. P. Wireless, Ltd., the Pax Manufacturing Co., and Messrs. J. H. and G. D. Duke from selling or offering for sale or disposing of otherwise than as part of a wireless set any wireless valve manufactured under any of the plaintiff company's letters patent and licensed for resale as part of a wireless set only.

Mr. Moritz, K.C., for the Mullard Co., said that the valves were sold under six or seven British patents, which were the property of his clients. Each valve sold to a set manufacturer was sold in a plain carton bearing a notice that there was a restrictive licence. It was an extremely lucrative trade for small manufacturers to obtain valves for the retail trade and sell them to the public at cut prices, and it was a source of considerable trouble to valve manufacturers. The Mullard Co. had for some time past received complaints from legitimate traders about cut prices. In the present case a notice was exhibited in the window of the defendants' premises in which it was announced that all valves were sold to the public at trade prices.

Mr. Phillips, for the defendants, C. P. Wireless, Ltd., said that company had ceased to carry on business on October 12th last. There was no evidence that that company was in control or management of the Pax Manufacturing Co., and he contended there was no ground for granting any injunction against them.

In giving judgment, his Lordship said that the defendants, other than C. P. Wireless, Ltd., had not thought it necessary to appear. The evidence was perfectly plain and there must be an injunction against them. He was not satisfied that C. P. Wireless, on the evidence, had ceased to carry on business, but if they had the injunction would not hurt them. He granted an injunction in the terms of the notice of motion against all the defendants.

Alleged Lamp Trade-mark Infringement

In the Chancery Division on December 9th Mr. Justice Eve had again before him the motion by the General Electric Co., Ltd., to restrain Goodman's (Leeds), Ltd., until the trial of the action, from infringing the plaintiffs' trade-mark "Osram" in connection with electric lamps by the use of the word "Ozmar." The defendants maintained that the words were distinctive and not likely to cause confusion.

Counsel for the plaintiffs now said that the defendants had agreed to give an undertaking in the terms of the notice of motion until the action, which would be heard next term, when the matter could be dealt with by witnesses.

Mr. Justice Eve agreed to the order as asked, and said he would retain the action for trial before himself. He added that the case appeared to involve an exceedingly interesting technical point.

The Ward Electrical Co., Ltd.

In the Companies Court, Chancery Division, on Monday Mr. Justice Bennett had before him a petition for the compulsory winding up of this company. Counsel for the company said that the petition was made by the company itself. The matter had been stayed on two occasions, with a view to a scheme being presented. A scheme had been prepared and accepted, but unfortunately the formal guarantee had not been acceptable. The scheme provided for the payment of a composition by instalments. The first two were to be guaranteed.

His Lordship made the usual compulsory order.

British Overseas Electrical Trade in November

	Exports.			Imports.			Re-exports.		
	Electrical exports for Nov., 1932	Inc. or dec. as compared with Oct., 1932.	Inc. or dec. as compared with Nov., 1931.	Electrical imports for Nov., 1932.	Inc. or dec. as compared with Oct., 1932.	Inc. or dec. as compared with Nov., 1931.	Electrical re-exports for Nov., 1932.	Inc. or dec. as compared with Oct., 1932.	Inc. or dec. as compared with Nov., 1931.
Insulated wires and cables ...	£98,445	— £1,200	— £4,987	£30,284	+ £6,258	— £55,591	£360	+ £196	— £84
Electric carbons ...	1,450	— 1,927	— 806	9,542	+ 579	— 32,857	95	+ 81	— 176
Arc lamps and searchlights ...	505	+ 47	+ 342	118	+ 118	+ 5	60	+ 60	+ 43
Incandescent lamps	29,897	— 10,045	+ 8,537	25,730	+ 2,386	— 81,724	992	+ 627	+ 112
Other lighting apparatus ...	24,194	— 2,264	— 8,855	28,147	+ 1,263	— 70,513	1,595	— 180	+ 467
Batteries and accumulators ...	61,670	+ 4,471	— 3,519	5,763	— 888	— 75,515	291	+ 173	— 92
Meters and instruments ...	16,670	— 5,706	— 9,711	36,122	+ 11,700	— 12,178	447	+ 67	+ 50
Unenumerated electrical goods and apparatus	82,014	— 11,948	— 50,116	59,775	— 8,557	— 100,093	2,473	— 2,334	— 2,564
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	20,984	— 9,325	+ 1,584	441	+ 269	— 3,904	18	+ 18	— 1,214
Submarine telegraph and telephone cables...	46,273	— 59,119	+ 39,338	—	—	— 24,100	—	—	—
Telegraph and telephone apparatus	150,954	— 6,547	+ 27,138	112,502	— 23,246	— 376,857	3,553	— 436	— 1,684
Electrical Machinery—									
Railway and tramway motors	304	— 190	— 2,078	—	—	—	—	—	—
Other motors and generators ..	99,991	+ 9,477	— 51,709	—	—	—	—	—	—
Unenumerated electrical machinery	163,664	+ 11,098	— 32,899	41,293	— 3,297	— 152,459	5,321	— 142	— 5,360
Total	£797,015	— £83,178	— £87,741	£349,717	— £13,415	— £985,786	£15,205	— £1,870	— £10,502
Decreases for the first eleven months of the year... ...	Exports. £2,350,165			Imports. £4,032,927			Re-exports. £110,523		

Business and Industrial Notes

The Week's Electrical Trade News from all Sources, Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Another Swansea Contract

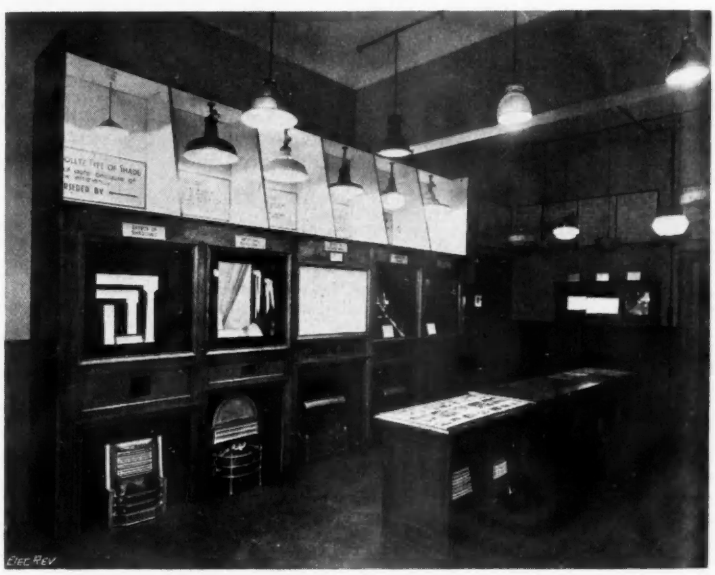
The Swansea Electricity Committee has decided to recommend to the Town Council the acceptance of the tender of Messrs. Dorman, Long & Co., Ltd., for the structural steel work for the main power house at the Tir John North station. The quoted price is £151,165 and is the lowest of twenty-nine tenders received. Seventy-five per cent. of the labour on the work will be done in Swansea. Messrs. Dorman, Long quoted in conjunction with Messrs. Rees & Kirby, of Morriston, and it has been agreed that Messrs. Rees & Kirby will fabricate all the steel work they can undertake at their works and will concentrate on the portions of work which require the most labour in fabrication, such as roof steelwork, bunkers, &c.

Lighting Service at Hackney

The Hackney Electricity Department is, we think, the first municipal undertaking in this country to establish its own local "Lighting Service Bureau." The idea arose from a resolution at an E.L.M.A. conference recently, and Mr. L. L. Robinson, the borough electrical engineer, and Mr. P. G. Bowden, the Department's lighting specialist, have lost no time, for at Lower Clapton Road consumers, contractors, &c., can now see very convincing demonstrations of how to employ electric lighting to the best advantage. Contractors are encouraged to make use of the bureau at any time for giving demonstrations to their clients.

Six "rooms" with white, dirty, black, yellow, orange and blue walls, respectively, have a common opal glass cover. The greatest light intensity at the part of the glass covering the white room shows where there is the least light absorption by the walls. A model of a building face floodlighted at will all round and from various angles, shows that completely diffused floodlighting destroys the character of architecture. Eight rooms each have a 15-W lamp, and the increased lighting intensity on the opal glass cover as the result of removing the partition walls progressively is remarkable. These are some of the demonstrations arranged on the E.L.M.A. cubicle principle.

Various makes of industrial fittings are wired up with sliding resistances graduated in foot-candles. This not only enables the undertaking to show a prospective consumer the advantage of "that little more light," but it also permits the accurate designing of an installation according to the intensity chosen by the consumer. By varying the centres of two industrial fittings the effects of incorrect and correct spacings are depicted. The Holophane colour-combination curtain arranged in the existing garden recess will impress those interested in stage and shop-window lighting, &c. There is a suitably equipped room which can be darkened to demonstrate the difference between the lighting from a single unit for properly diffused lighting and that from several bare lamps in conical shades. In the dining room there are several displays of cornice lighting.



A view of the Hackney "Lighting Service Bureau"

Electrical Machinery Exports in November

The following statistics relate to electrical machinery exported from this country during November last, notes of increases or decreases being made as compared with the corresponding month of last year. With regard to a similar table referring to October which appeared in our November 18th issue (page 754), readers are requested to note that while the differences in value were shown correctly, the figures for October, 1931, were inadvertently included in the third column.

	Quantities.			Values.		
	Nov., 1932. Tons.		Increase or decrease as compared with Nov., 1931. Tons.	Nov., 1932. £		Increase or decrease as compared with Nov., 1931. £
European countries	453	–	365	94,280	–	48,601
Japan	1	–	33	411	–	7,569
South American countries	52	–	44	8,201	–	10,351
South and South-West Africa	283	–	17	41,235	–	3,908
British India	403	+	140	58,363	+	14,571
Australia	57	+	1	10,535	+	1,064
New Zealand	61	–	66	10,725	–	12,851
Canada	79	–	75	7,867	–	8,111
Other Countries	227	–	80	32,342	–	10,930
Total	1,616	–	539	£263,959	–	£86,686

Our usual monthly table referring to the United Kingdom's overseas trade generally appears on the preceding page.

New Showrooms at Brighton

The new Brighton electricity showrooms are now nearly completed, and they are to be formally opened in January next. In the meantime, the electrical engineer has been authorised to arrange for a display there as early as possible before Christmas.

The Bolivian Radio Market

A Department of Overseas Trade report states that present economic conditions in Bolivia practically exclude the importation of radio apparatus but that when normal times return there should be room for considerable expansion, and there seems to be no reason why United Kingdom manufacturers should not share considerably in the market.

Birmingham Buys British

Birmingham City Council at a recent meeting passed a resolution instructing Committees and Departments of the Corporation to buy only materials or goods produced or manufactured in the British Isles, India, or the British Dominions, unless otherwise instructed. The resolution was opposed by Alderman Harrison Barrow, who said he had been informed that the proposal was due to the fact that Canadian doors, so-called, although coming from Canada, were made in the United States. Councillor J. Fryer stated that the Electric Supply Department had almost invariably bought British electrical equipment instead of foreign but the City had to pay extra. Alderman Saunders (acting deputy mayor), who is the Birmingham secretary of the Woodworkers' Society, said that some years ago he came to the conclusion that 60 per cent. of the material used in the construction of the municipal houses was foreign.

Registered Electrical Contractors

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Syddall, H., Brooklands, Cheshire.
Yates, F. L., Blackburn.
Smith, S., Moseley, Birmingham.
Burney, T. W., Gateshead-on-Tyne.
Rawson, W., & Co., Salford.
Brooks, J., Salford.
Hassall, H., & Co., Manchester.
Erdington Electrical Co., Ltd., Erdington, Birmingham.

At the same meeting six applications were declined.

Australian Radio Proposal

Speaking on the Postmaster-General's estimates in the House of Representatives, Mr. Thorby, a New South Wales member, urged the Government to give immediate notice of its desire to terminate the agreement entered into with Amalgamated Wireless (Australasia), Ltd., in 1927. Under this agreement, he said, the Government paid to the company a royalty of 3s. from every licence fee on account of patent rights. Already £250,000 had been collected on patent rights worth only £96,000, and by terminating the agreement the Government could save £73,000. There was great secrecy about the company and, although there were three Commonwealth representatives on the board, it had a "strangleho'd" on wireless in Australia.

The Irish Tariff on Radio Apparatus

In Dail Eirann on December 7th Mr. Sean Lemass, Minister for Industry and Commerce, moved an amendment on the com-

mittee stage of the Finance (Customs Duties) Bill, No. 4, reducing the duty on imports of wireless parts—loudspeakers, transformers, and condensers—from 33⅓ per cent. to 25 per cent. The 50 per cent. duty would remain on imports of complete sets. Mr. Lemass said that there was every prospect that the manufacture of wireless sets would be undertaken in the Irish Free State in the near future, and any increased demand that might arise from the establishment of the new wireless station at Moydrum, Athlone, would be supplied from Free State sources. The amendment was agreed to.

A Brighter Outlook in Australia

A definitely improved tone generally in business in Australia and considerably brighter prospects are indicated by a recent report of the Australian Association of British Manufacturers. About the middle of last year the feeling developed that the depression in Australia had touched bottom, and while no very substantial upward trend is yet discernible it is generally thought that the period of recovery has begun. The principal events which arrested the downward course are stated to be: (1) The conversion of the National Debt to lower interest rates; (2) the departure of Great Britain from the gold standard; and (3) important political changes. The downward revision of the tariff, which is progressing slowly but fairly satisfactorily, is the principal internal adjustment still to be made. There cannot be a return to "pre-depression" conditions until international action is successful in bringing about an increase in world price levels.

Neon Tube Production

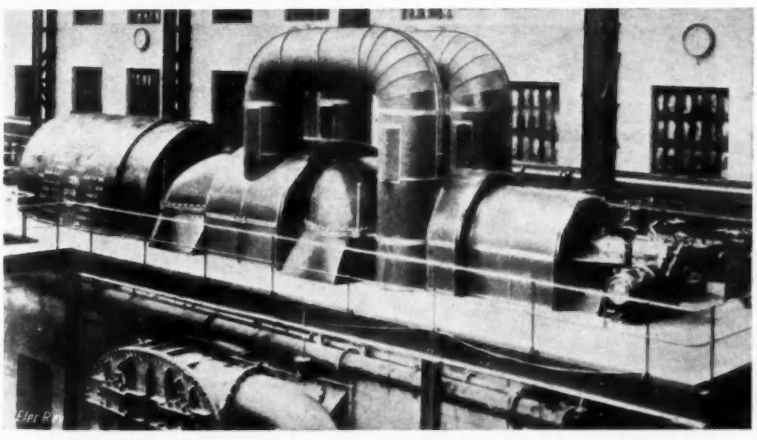
Messrs. James Kilpatrick & Son, Ltd., Paisley, invite quotations and particulars from manufacturers of apparatus and accessories relative to the reproduction of neon lighting tubes and signs. (See our advertisement pages to-day.)

French Plant for French Power Stations

In a circular recently issued by the French Ministry of Public Works attention is drawn to the fact that concessionaires for hydro-electric undertakings often place contracts for material and plant with foreign firms. In view of the difficult times through which the French industry is at present passing, the Ministry has decided to ask all concessionaires to include in the contracts with contractors a clause to the effect that any hydraulic and electrical plant must be obtained in France. It is provided, however, that where plant cannot be obtained in France under normal prices and quality, orders may be placed abroad, a special permit to do so having, however, first to be obtained from the Ministry.

An Electric Furnace Agreement

Wild-Barfield Electric Furnaces, Ltd., and Birmingham Electric Furnaces, Ltd., have recently reached an agreement for the interchange of information and rights under their respective patents relating to electric furnaces employing centrifugal fans, and to the air-circulation methods used with such fans. The arrangement will give furnace users the benefit of the combined experience of both these well-known companies, and will enable the growing demand for low-temperature operations, such as the tempering of steel and the heat-treatment of aluminium and its alloys, to be met in an increasingly efficient manner. Further research and experimental work is being carried out by both companies.



The second Parsons 25,000-kW turbo-alternator supplied to the Brimsdown power station

The "News-Chronicle" Sign

The recent advertisement of Messrs. W. T. Henley's Telegraph Works Co., Ltd., featuring the sign "Don't overlook the *News-Chronicle*" stated that over 285 miles of Henley wires were used in the construction. This figure referred, of course, to Henley winding wire, although this was not made clear in the advertisement. In addition to the winding wire, over 500 yards of Henley lead-covered h.p. cable and a quantity of v.i.r. wire for the l.p. wiring were used.

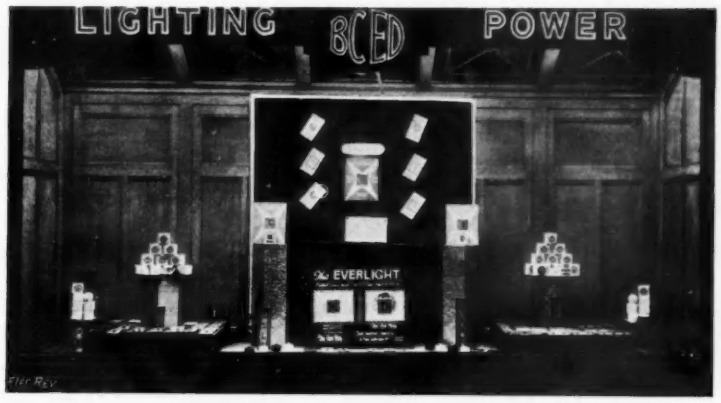
New Municipal Showrooms and Offices

The Swindon Electricity Committee has requested the borough surveyor to prepare plans and estimates for the erection of electricity showrooms on the east side of Regent Circus.

Plans and estimates are also to be submitted for additional office and stores accommodation for East Ham Electricity Department.

The E.A.W. at Belling's Showrooms

On Tuesday last week members of the Electrical Association for Women paid a visit to the London showrooms of Messrs. Belling & Co. at 313, Regent Street, W.1. The visitors, who were accompanied by the director, Miss C. Haslett, numbered about a hundred, and as it was not possible to accommodate comfortably such a large number in the showrooms they met first at the Langham Hotel, Portland Place. A display of cookers, fires, water heaters and other domestic appliances was arranged there, and Mr. C. R. Belling gave a talk on the construction of the modern electric cooker. Tea was served and afterwards the members were conducted in small parties round the showrooms.



A display of "Everlight" switches and switch plates (Patent Switch and Fuse Indicator Co., Ltd.) in the Bradford Corporation Electricity Department's window

Messrs. C. A. Parsons & Co.'s Activities

The orders received by Messrs. C. A. Parsons & Co., Ltd., during 1932 give evidence of a growing appreciation of the economies to be effected by generating electricity directly at the voltage of transmission. The period under review saw the installation of a second 25,000-kW, 33/36-000-V turbo-alternator at Brimsdown, and other contracts for plant to be operated at similar pressures included an 18,000-kW turbo-alternator for the South Wales Power Co., a 20,000-kW set for Cape Town, and two 30 000-kW units for the new Swansea station. The most important order for a machine required to generate at ordinary voltages was that for a 30,000-kW turbine, alternator, and condensing plant for Brighton Corporation. The largest machines which left the Heaton works during the year were the three 50,000-kW turbines and alternators for the Dunston Power Station. Two units of 36,000-kW each were also completed for the Copenhagen power station, and a 30,000-kW turbo-alternator was officially put into service at Hackney. A 20,000-kW set was started up at Congella (South African Electricity Commission), one of 18,750 kW at Lots Road station, and a 12,500-kW set at Pretoria. An important development has been in connection with the "inverted" type of condenser, while a series of small transformer units has been developed to suit the requirements of rural electrification. Several 6,000-kVA 13,500-V transformers have also been built, but of greater technical interest is a transformer to give 600,000 A under short-circuit conditions. Important improvements are reported in the design and manufacture of turbine blading, and further advances have been made in the protection of blading against erosion.

The Birmingham Electric Club

The Committee's report for the year ended November 30th last records an increase of 23 in the membership, raising the total to 330. A number of lectures were delivered during the

year, and this year's annual visit was to the Bradford works of the English Electric Co., Ltd., in May. At the annual meeting to-day (Friday) a motion for the adoption of revised rules is to be presented. The accounts for the year show a substantial balance of income over expenditure.

Electrolytic Copper Production in Czecho-Slovakia

Reuters Trade Service learns that the Czecho-Slovak mining union proposes to form a company for the production of electrolytic copper. Fifty per cent. of the capital would be subscribed by the State and the province and the remainder by the public. It has been decided to construct a smelter at Kompach. The copper ore to be treated there would be obtained from the valleys of the Göllnitz and Hernad rivers.

The Moorcock Inn, Clitheroe

Irish Free State Electrical Imports

A very quiet tone continues to prevail in the electrical trade in the Irish Free State, the value of imports of electrical machinery, fittings, and apparatus during October amounting to £44,960, as compared with £65,587 in October, 1931. The appended table gives the imports during the first ten months of the year, from which it will be seen that as compared with the corresponding period of 1931, the aggregate now shows a decline of £17,614 :—

	JANUARY TO OCTOBER.	
	1931.	1932.
	£	£
Electrical machinery	155,553	146,056
Electric wires and cables	78,266	88,628
Radio sets and parts	87,877	115,284
Electric lamps and parts	49,437	43,834
Other electrical goods	161,975	129,752
Copper wire	15,678	7,618
Totals	£548,786	£531,172

A Comparison of Washing Methods

An interesting working window display has recently been staged by the Beckenham Electricity Department at its new showrooms. It consisted of a clever comparison of the old and new method of washing. An old woman was depicted wearily washing with an old-fashioned rubbing board and copper, &c., in contrast with the modern electric method of washing carried out by the Hotpoint-B.T.-H. electric washing and wringing machine. The same machine is also seen with its attachable rotary ironer in place of the wringer. Attended by a smartly overalled modern young woman, the whole window, particularly at night with its changing lighting effect, attracted much favourable comment. The photograph reproduced herewith gives a good idea of the general arrangement of the window.

German Electrical Imports and Exports

The official returns just to hand show that the imports of electrical machinery and apparatus into Germany during the nine months ended with September last attained a value of £862,550 as compared with £1,367,100 in the corresponding period of 1931. The exports of similar material from Germany during the nine months amounted to £12,143,400, this figure comparing with £17,694,900 in the corresponding period of 1931. The import total was made up of £131,800 of electrical machinery, and parts and apparatus to the extent of £730,750. The respective figures for the exports were £2,951,100 and £9,192,300.

Price Reductions

Messrs. A. W. Beuttell, Ltd., announce reductions in the prices of "Linolite" strip reflectors.

Prices of Materials

Messrs. F. Smith & Co. report, December 14th : Electrolytic copper bars, sheets and wire rods, no change. Electrolytic copper h.c. wire, 5$\frac{15}{16}$d., $\frac{7}{16}$d. dec. Silicium bronze wire, 7$\frac{1}{16}$d., $\frac{1}{8}$d. dec.

Messrs. Edward Till and Co. report, December 14th : India-rubber, Para fine, 4$\frac{3}{4}$d., $\frac{1}{4}$d. dec.

Messrs. James and Shakespeare report, December 14th : Copper bars (best selected), sheet and rod, no change. English pig lead, £12 10s., £1 dec.

The Hotel Lighting Campaign

The accompanying photograph shows activity on the part of the Clitheroe Corporation Electricity Department. The Moorcock Inn stands high up on the moors surrounding Clitheroe and is a very well known road-house doing considerable catering business. The outdoor lighting, which was carried out under the supervision of Mr. A. H. Todd, borough electrical engineer, marks the first occasion on which a public supply of electricity has been available in the neighbourhood. The proprietor has been the subject of very heavy attacks from the "E.D.A./E.L.M.A. Hotel Lighting Campaign troops" with excellent results, the interior arrangements being quite as good as the exterior. It is anticipated that the floodlighting and garden lighting will be carried on throughout the winter.

At a general meeting of electrical interests held in Douglas (I. of M.) on November 30th, it was decided to form an E.D.A. Circle for the Island. The meeting was held at the Douglas electricity showrooms under the chairmanship of Mr. B. Kelly, borough electrical engineer. Mr. A. V. Bellamy, a local member of the Electrical Contractors' Association, was appointed hon. secretary, and further meetings will be held immediately. Following the meeting many of those present attended the fifth annual staff dinner of the Douglas electricity undertaking, at which several speakers referred to the new Circle. The Hotel Lighting and Bedroom Heating Campaigns will form the main activity of the Circle for the next month or two.

An immediate result of the campaign has been the formation of a new E.D.A. Circle in Southport, the chairman being Mr. E. Moxon, borough electrical engineer. Campaign lectures have been given or are about to be given in Manchester, Buxton, Southport, Morecambe and Blackpool.

A dinner was arranged under the auspices of the Leicestershire and Warwickshire E.D.A. Circle on December 9th, at the Union Hotel, Hinckley, at which over seventy members of the contracting and manufacturing trades assembled to meet Messrs. A. D. Phillips and O. M. White, the general manager and deputy manager of the Leicestershire and Warwickshire Electric Power Co. Mr. E. C. Burdett, a Hinckley contractor and the chairman of the Circle, proposed the toast of the principal guests, who briefly responded. The toast of the Circle was proposed by Capt. J. C. Chaytor of the Tamworth Circle and Mr. R. B. Giles, hon. secretary, replied.

Trade Announcements

C.C.A., Ltd., 101, Bunhill Row, E.C.1, has been appointed sole London agent for Messrs. Trevelyans (Birmingham), Ltd., manufacturers of "Treva" electrical accessories.

A well-thought-out demonstration of the Hotpoint-B.T.-H. washing and wringing machine in the window of new showrooms of the Beckenham Elecricity Department

Messrs. W. T. Henley's Telegraph Works Co., Ltd., have opened a new stores depot at Hood's Loaning, Dumfries, where stocks of cables, wires, flexible cords, jointing materials, etc., will be held ready for immediate delivery. The telephone number is Dumfries 823, and the telegraphic address "Henletel Dumfries." Communications other than orders should still be sent to the company's head office or the Glasgow branch.

Messrs. Brown Brothers, Ltd., Great Eastern Street, E.C.2, have been appointed sole wholesale distributors to the cycle and motor trade for Garrard electric clocks.

Messrs. Arthur Hunstone & Co., Anchor Works, Birch

Street, Walsall, are now the sole manufacturers in this country of "Kiblok" nuts.

Social Events

The fifth annual dinner of the West Hartlepool Corporation Electricity Department was held on December 5th, at the Raglan Hotel, among those present being the Mayor (Coun. F. B. Magee), Mr. Tillotson (borough electrical engineer), Mr. A. G. Port (Hartlepool district engineer of the North Eastern District Supply Co., Ltd.), and Mr. A. Parkin (British Electrical Development Association). Among the toasts were those of "The Mayor and Corporation," proposed by Mr. W. A. Smith and responded to by the Mayor; and "The Electricity Department," submitted by Mr. Edgar Phillips and replied to by Mr. Tillotson.

The annual staff dinner of the Farnworth Urban District Council's electricity undertaking was held on November 30th. Councillors G. Thomlinson, chairman of the Council, J. Stevenson, the chairman of the Electricity Committee, and R. Stafford, the vice-chairman of the Electricity Committee, were present. Councillors spoke of the good work which had been done during the year by the Department, particularly with regard to the wash-boiler scheme, 451 boilers having been put into use since the middle of August, Mr. A. J. Hutchinson, the engineer, gave progress statistics; Mr. J. Conroy, the meter engineer, proposed the guests; and Mr. J. B. Ashworth, sales engineer, the chief. A musical programme followed.

Recent Contracts

The Alton Battery Co., Ltd., has recently received orders for batteries for the following: The Glenlee and Tongland stations of the Galloway Water Power Board; Park Prewett Mental Hospital; Imperial and International Communications, Ltd., for use in Peru; Northern Rhodesia Posts and Telegraphs Department; Leicester central generating station; and Barnwood and Hayling Island telephone exchanges. Renewals are also being supplied for batteries at Llandudno, Shrewsbury, and Ryde telephone exchanges.

Messrs. Blackstone & Co., Ltd., have recently received orders for "Unchokeable" pumps from a number of municipal authorities, including Dorking, Erith, Gloucester, Westbourne, Rochford, Twickenham, Nottingham, Torquay, Wakefield and Wrexham.

The English Steel Corporation has, according to *The Times*, received an order for the whole of the solid-forged boiler drums required for the three high-pressure Stirling boilers to be installed at the Southwick power station of Brighton Corporation.

Messrs. Kryn & Lahy (1928), Ltd., of Letchworth, have secured a contract valued at over £20,000 from the Sullivan Machinery Co., which has hitherto imported its products from the United States. The order comprises steel castings and precision machine work.

Calendars and Diaries

The 1933 diary received from Messrs. Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13, is neatly bound in brown leather, and in addition to the usual postal information contains a number of tables of use to electrical engineers.

A calendar with exceptionally large daily slips has been sent us by Messrs. Lindsay & Williams, Ltd..

"Evening, York," is the title of the artistic calendar of Messrs. Ernest F. Moy, Ltd.

The metal-framed desk calendar of British Insulated Cables, Ltd., has monthly date cards together with tables relating to the current-carrying capacity of v.i.r., paper-insulated and lead-covered cables. The B.I.C. wall calendar, in addition to displaying a sheet with conspicuous figures for the current month, is provided with smaller sheets showing the preceding and following months' dates, as well as those for the complete years 1931, 1932, and 1933.

The 1933 diary of the National Union of Commercial Travellers, 24, Thavies Inn, Holborn Circus, E.C., contains a considerable amount of information of value to the Union's members, and includes notes on the law affecting commercial travellers, employment hints, a list of hotels in the British Isles, &c. The diary is bound in dark green morocco, and has a metal clip.

New Year Holiday

The works of Messrs. Bruce Peebles & Co., Ltd., will close on Friday, December 30th, and will be reopened on Monday, January 9th. The head office in Edinburgh will be closed on December 26th and on January 2nd.

New Catalogues and Lists

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.4.—Publications Nos. H. 828 and 830, dealing respectively with "Ediswan" domestic electrical appliances and suggestions for electrical Christmas presents.

J. A. Crabtree & Co., Ltd., Walsall.—A leaflet (No. 1075) describing "Crabtree" cooker control units.

Curfew Electric Heaters, Curfew Poultry Farm, Gogmore, Chertsey.—An illustrated catalogue of electric poultry appliances.

Birkbys, Ltd., Liversedge, Yorks.—A pamphlet and price list relating to "Elo" mouldings, resins, and varnishes.

Blackstone & Co., Ltd., Stamford.—Leaflets dealing with "Blackstone" totally enclosed "spring injection" oil engines, petrol and kerosene engines, water supply pumping sets, and lighting plants.

Wholesale Fittings Co., Ltd., 23, 25, 27 & 37, Commercial Street, E.1.—The company's 1932-33 illustrated catalogues of radio receivers and accessories.

General Accessories Co., Ltd., 18-22, Euston Buildings, N.W.1.—A 76-page illustrated catalogue of British-made electrical accessories.

Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, W.4.—Particulars (List No. 260) of the "Evershed" single operation recorder, by which various industrial operations—the starting and stopping of a machine, movements backward and forward, &c.—are shown on one chart.

James Robertson, 95, West Nile Street, Glasgow.—A 267-page catalogue, copiously illustrated, of radio receivers, components and accessories.

Bankruptcy Proceedings

C. A. Whittington, electrician and wireless dealer, 400, Abbeydale Road, Sheffield.—The first meeting of creditors was held at the Official Receiver's Offices, Figtree Lane, Sheffield, on December 7th. Debtor attributed his failure to "keen competition, which forced him to sell goods at very little profit and at times below cost, instalments and running expenses of a motor-car, bad debts and replacements, and costs of suing creditors." His statement of affairs showed unsecured liabilities of £866, and a deficiency of £771. The case being a summary one was left in the hands of the Official Receiver, as trustee.

W. J. Holyoake, electrical engineer, 2, Scott's Mansions, Claremont Hill, Shrewsbury.—First and final dividend of 3s. 5½d. in the £, payable December 14th at the Official Receiver's office, 22, Swan Hill, Shrewsbury.

C. Holdroyd, electrical engineer, 87, Buchanan Street, Blackpool.—Receiving order made December 7th on a creditor's petition.

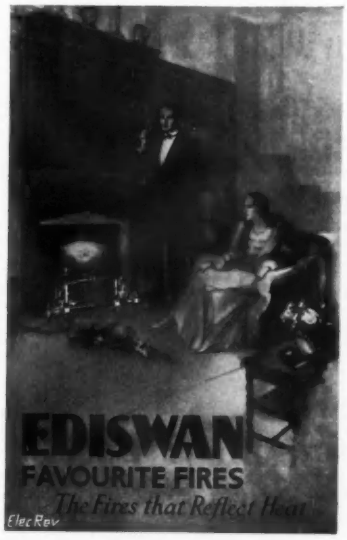
S. H. Lucas, electrical and radio engineer, 52, Commercial Road, Totton, Southampton.—Last day for receiving proofs for dividend December 23rd. Trustee, Mr. F. H. Langmaid, Midland Bank Chambers, High Street, Southampton, Official Receiver.

G. W. Jacob, wireless dealer, 29, Dimond Street, Pembroke Dock.—Receiving order made December 5th on debtor's own petition.

M. Goldsmith (Regent Radio Co.), wireless dealer, 24, Russell Street, Plymouth.—Receiving order made December 7th on debtor's own petition.

Company Liquidations

A.E.G. Electrical Co. of South Africa, Ltd.—The compulsory winding-up order was made against this company so far back as May 28th, 1918, upon the petition of the Board of Trade under Section 1 (7) of the Trading with the Enemy Amendment Act, 1916. Mr. G. W. Hutcheson, Assistant Official Receiver and liquidator, reports that the accounts filed under the liquidation show liabilities of £36,888, assets of £23,394, and a deficiency of £63,493 with regard to contributories, the issued capital amounting to £50,000. Of the company's shares 19,997 were held by the A.E.G. of Berlin and its nominees. The greater part of the assets were realised by the Controller appointed by the Board of Trade, who also discharged certain of the company's liabilities. The question whether the uncalled capital of £50,000 could be called up was considered by the Official Receiver, but this course proved to be impracticable. The claims of non-enemy creditors, other than those paid by the Controller, have been admitted for £322 and paid in full, and dividends amounting to £22,791 have been paid on account of the amount of £34,181 shown to be due to the A.E.G. of Berlin. The failure of the company was due to the stoppage of its business owing to the war.



An attractive new "Ediswan" fire showcard

Bagdad Tramways & Electric Lighting Syndicate, Ltd.—Winding up voluntarily. Liquidator, Mr. A. Reculez, 1, Queen Victoria Street, E.C. Particulars of claims by January 20th to the liquidator.

H. F. Ball, Ltd.—Winding up voluntarily. Liquidator, Mr. G. E. Titley, 10, Newgate Street, E.C.

Private Arrangement

H. Bannister (trading as H. Bannister & Co.), electrical engineer), 8, Newmarket Lane, Manchester.—At a recent meeting of creditors a statement of affairs was presented showing liabilities of £1,262 and net assets of £321, or a deficiency of £942. After some discussion the following resolution was passed: "In consideration of the execution creditors agreeing to accept payment of the costs incurred by them in full and handing over three-quarters of the balance of the proceeds of the sale of the stock, the deed of assignment, executed to Mr. McKellen, accountant, of Manchester, as trustee, be confirmed." A committee was also appointed, consisting of the representatives of the Warrington Electric Cables, Ltd., and the United Electrical Co., Ltd.

Dissolution of Partnership

J. Dalton Electrical Services, electrical engineers, 39, South Street, Dorchester.—Messrs. A. J. Dalton and R. S. Smith have dissolved partnership. Mr. Smith will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Aberdeen.—EMERGENCY LIGHTING AT INFIRMARY.—The question of the need for improving the emergency lighting at the Royal Infirmary is to be reported upon.

Aldershot.—EXTENSIONS.—The Electricity Committee is to lay cables in Canning Road, Highland Road, and Connaught Road.

Australia.—MUNICIPAL UNDERTAKINGS.—A deputation from the Local Government Association recently interviewed the New South Wales Minister for Labour and asked that electricity undertakings under the control of local government authorities should be excluded from the operation of the Gas and Electricity Act. The Minister is calling a conference of local government bodies and departmental officials to discuss the position.

Ayrshire.—OFFER TO PURCHASE UNDERTAKING.—At a recent meeting of the County Council a minute of the Finance Committee stated that a letter had been received from the Ayrshire Electricity Board forwarding a copy of an offer made by the Power Securities Corporation, Ltd., for the purchase of the Board's undertaking. An extract from the minutes of the Electricity Board was also forwarded, containing the Board's resolution that the offer should not be accepted. The Finance Committee agreed that "as the County Council had a substantial interest in the Ayrshire Electricity Board's undertaking, a chartered accountant of standing should be asked to advise as to the value of the offer made to the Board. It was decided to ask the Ayr Town Council to join in taking this advice." Moving an amendment to the minute at the County Council meeting Bailie Ritchie Scott Irvine was of opinion that this proposal should not be pursued but that the Council's energies should be devoted to assisting the Board to develop the electricity supply undertaking. The amendment was carried.

Barrow-in-Furness.—LOANS.—The Electricity Committee is to apply for sanction to loans of £20,000 for mains and £5,000 for apparatus. Sanction has been received to the borrowing of £850 for sub-station equipment in connection with the supply to Grange.

OVERHEAD LINES.—Permission has been obtained to erect overhead lines to supply the urban district of Dalton.

Bradford.—COMBINED HOUSE AND SHOP SUPPLIES.—The Electricity Committee recommends that the fixed half-yearly charge for electricity for combined houses and shop premises should be reduced from 15 to 12½ per cent. of the rateable value of

Messrs. Leonard G. Tate have recently been showing this special display of "Efesca" domestic appliances and fittings at their premises at 31, Bond Street, Ealing

the property, with a further reduction to 8¾ per cent. in respect of rateable value in excess of £50.

Bridge of Allan.—OVERHEAD LINE OBJECTION.—The Town Council has informed the Scottish Midlands Electricity Supply, Ltd., that unless the greater portion of the cable from the railway station to Glen Road is placed underground it cannot agree to the extension.

Bridlington.—NEW CHARGES.—The Town Council has adopted the following new electricity tariffs: General lighting, up to 500 kWh per quarter, 5½d. per kWh; from 500 to 1,000 kWh, 5¼d.; from 1,000 to 1,500 kWh, 5d.; exceeding 1,500 kWh, 4¾d.; exceeding 2,000 kWh, 4½d.; exceeding 10,000 kWh per annum, 4¼d. Outside signs or illuminations, 4d. Cinemas: Apparatus only, 3d. Heating, up to 100 kWh per quarter, 4d.; 100 to 250 kWh, 3d.; 250 to 500 kWh, 2½d.; 500 to 1,000 kWh, 2¼d.; exceeding 1,000 kWh, 1¾d.; exceeding 10,000 kWh, or for any refrigerating plant, 1¼d. Power, up to 100 kWh per quarter, 3d.; 100 to 500 kWh, 2d.; 500 to 1,000 kWh, 1½d.; beyond, 1d. Domestic tariff, where electricity only (or coal and electricity) is used for cooking and domestic purposes, including heating but excluding lighting, ¾d.; minimum charge per quarter, 7s. 6d.

Brighton.—MAINS EXTENSIONS.—The Electricity Committee has authorised the extension of mains at a cost of £3,472.

CHRISTMAS ILLUMINATIONS.—To encourage Christmas shopping the main streets of the town are now made to look particularly attractive at night by lengthy festoons of coloured lights. Many thousands of these lights are in use, the cost of the illuminations being borne by the Traders' Association.

Cardiff.—SPECIAL ORDER PROPOSAL.—The Electricity Committee has asked the Rural District Council whether it would object to the Corporation's making an application for a Special Order to supply electricity to the Thornhill, Cyncoed and Lisvane districts.

MAINS EXTENSIONS.—Mains extensions are to be carried out at a cost of £910.

ELECTRICAL FITTINGS FOR HOSPITAL.—The Hospital Committee is to obtain tenders for electrical fittings for the Llandough Hospital.

Carlisle.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to a loan of £10,000 for meters and wiring installations.

MAINS EXTENSIONS.—Mains extensions costing £1,569 are to be carried out.

Chesterfield.—METERS.—The Town Council has applied for sanction to a loan of £10,000 for meters.

Crick (Warwick).—LIGHTING OF LILBOURNE HOUSES.—The Rural District Council has applied to the Ministry of Health for permission to install electric lighting in houses at Lilbourne.

East Ham.—MAINS EXTENSIONS.—The Corporation has obtained sanction to the borrowing of £22,126 for mains.

Edinburgh.—PROVISIONAL ORDER.—Application has been made by the Corporation for a Provisional Order under the Private Legislation Procedure (Scotland) Act, 1899, containing a number of provisions in relation to the electricity undertaking with regard to the limits of the area of supply, price, minimum charges, etc.

Errol.—ELECTRICITY SCHEME DELAYS.—Subscribers to the Grampian electricity scheme in Errol are to write the Grampian Electricity Supply Co. to the effect that they think they have a good case for breach of contract, and unless they receive a satisfactory reply they intend to take legal proceedings. The company, it is alleged, failed to implement its promise to introduce electric lighting in Errol in October, 1931. Last March the Ministry of Transport held an inquiry at which evidence was taken from the Grampian Co. and from two landowners. The question of wayleaves was settled but the matter of compensation was now in dispute. It is stated that £2,000 has been spent by householders and others on wiring and fittings. Until a month ago the streets were in total darkness, as the gas lamps had been dismantled in the hope that electricity would be supplied. A separate plant has now been installed for street lighting.

Exeter.—SPECIAL ORDER APPROVED.—The Order extending the area of supply to the parishes of Exminster, Kenn, Shillingford, and Dunchideock has been approved by the Electricity Commissioners.

EXTENSIONS TO LONGDOWN VILLAGE.—Mains extensions are to be carried out to Longdown Village at a cost of £1,435.

LOANS.—Sanction has been obtained to a loan of £50,000 for mains and services, and the Electricity Committee is to seek sanction to the borrowing of £5,000 for wiring installations.

Glasgow.—SHETTLESTON AND TOLLCROSS SUPPLIES.—As a result of the termination of the agreement with the Clyde Valley Electrical Power Co. for the supply of electricity in the Shettleston and Tollcross area, the Corporation is to take over the l.p. supply on January 1st. A special sub-committee is to continue negotiations with the company.

PROGRESS DURING OCTOBER.—Under the Electricity Department's scheme 125 houses were wired in October, making a total of 36,644, while 36 hired appliances were installed, bringing the total to 19,162.

MAINS EXTENSIONS.—Distributing mains are to be laid at a cost of £12,985.

Gravesend.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £6,000.

Hampton.—BATH LIGHTING.—The Recreations Committee is considering the floodlighting of the swimming bath.

Irish Free State.—DONEGAL SUPPLIES.—A local firm has secured authority from the County Council and from the Electricity Supply Board to supply electricity to the town of Donegal and its hospitals.

Kent.—NEW SUPPLY COMMENCED.—The South-East Kent Electric Power Co., Ltd., has commenced a supply of electricity at Shepherdswell, Eythorne, and Alkham. The company offers a free electric iron to any new consumer accepting its wiring estimate up to December 24th.

Leeds.—THE HIRE-PURCHASE OF SMALL COOKERS.—The Electricity Committee is to obtain a report regarding the proposed sale on hire-purchase terms of small cookers, and has arranged to interview the Sutton Trustees with reference to the installation of such cookers and also wash-boilers in houses to be erected by the Trustees off Selby Road.

Lincoln.—UNEMPLOYMENT SCHEME.—The City Council has included in an unemployment scheme the cabling of the Cross

Street area, with a h.p. sub-station costing £7,610, the provision of a similar station in Monks Road area with new l.p. mains (£3,190), a h.p. sub-station and l.p. mains (£1,884) in the Union Road area, and l.p. mains in other parts of the city (£1,500).

Littlehampton.—PROSPECT OF CHEAPER ELECTRICITY.—The Urban District Council has consented to the Sussex Electricity Supply Co.'s making application for a Special Order suspending the power granted to the Council in 1926 relating to the purchase of the undertaking, subject to certain conditions. It is proposed that the maximum charges should be reduced for each winter quarter to 12s. 6d. for up to 15 kWh, with a " unit " charge of 10d. for over 15 kWh; and for the summer quarters to 8s. 4d. for up to 15 kWh, with a " unit " charge of 10d. for over 10 kWh, with the following tariff :—Lighting : First 350 kWh per quarter for lighting, 10d.; beyond, 9d. Power and heating : Up to 150 kWh per quarter, 6d.; next 100 kWh, 5d.; next 100 kWh, 4d.; where quarterly consumption exceeds 300 kWh, first 150 kWh per quarter, 4½d.; next 100 kWh, 4d.; beyond, 3½d. Cooking, refrigeration and water heating : 2d. per kWh, inclusive of free hire of cooker, meter rental, internal installation up to 30 feet, and maintenance; if cooker is hired or bought, 1½d. per kWh. Two-part domestic tariff, up to 800 sq. ft. floor area, a standing charge of £3 8s. 6d. per annum; from 801 to 1,000 sq. ft., £3 18s. 6d.; and for every additional 200 sq. ft. or less, 15s., plus 1½d. per kWh. Similar rate for commercial purposes, fixed charge of 7s. 6d. per quarter per 100 W installed, with a minimum standing charge of £15 per annum, plus 1½d. per kWh. Meter rents : 10 A, 2s. per quarter; 20 A, 3s.; 40 A, 4s.; 50 A, 5s.

CHANGE-OVER.—The Sussex Electricity Supply Co., Ltd., is to apply to the Electricity Commissioners for consent to change over the system of supply from d.c. to a.c.

INSTALLATION IN COUNCIL HOUSES.—The Housing Committee recommends the granting of permission to the Sussex Electricity Supply Co., Ltd. (subject to certain conditions) to install electricity in Council houses where the tenants require a supply.

Liverpool. — ELECTRICITY UNDERTAKING'S FINANCIAL POSITION.—At a recent meeting of the City Council, reference was made to the shrinkage of the profit on the Electricity Supply Department, which dropped from £152,000 in 1928 to £94,000 in 1931-32 despite the additional capital put into the undertaking. One member said the gross profit on the huge undertaking was only equal to seven per cent., while the net profit was not one per cent. It was suggested that outside areas were being provided with cheap electricity at the expense of the citizens of Liverpool. The total expenditure on electricity supply account had been £9,738,000, and the undertaking was valued by the auditors at £8,000,000. It was alleged that much of the plant that had been included had become obsolete. In reply it was stated that if the undertaking was privately owned the shareholders would be satisfied with the position. Outstanding capital was less than £7,000,000, and yet the auditors said it was worth £8,000,000. The gross profit of the undertaking on the amount of capital was 10 per cent. In Liverpool they were charging 3½d. per kWh, against 4½d. in Birmingham and 4¾d. in Manchester.

ELECTRICITY FOR SEFTON.—The Electricity Department is arranging to give a supply of electricity to Sefton—one of the rural districts to the north of the city—at a cost of about £850.

FLOODLIGHTING OF ABATTOIRS.—Owing to the amount of traffic using the Stanley abattoir, it is intended to have the transport yard floodlighted.

Lochmaben.—PUBLIC LIGHTING.—The Town Council has decided to have the public lighting converted from gas to electricity.

Ludlow.—PUBLIC LIGHTING.—The Lighting Committee proposes that the electricity and gas companies should be invited to submit tenders for the lighting of the whole town for a period of fifteen years. At present the larger part of the town in lighted by electricity.

Manchester.—ADDITIONAL FACILITIES.—Two smaller types of all-enamelled cookers are now being offered for hire by the Electricity Department and cooking utensils with special flat bottoms are available on hire-purchase terms.

CONTINUED PROGRESS.—During October an increase of 2,849 kW in connections is reported by the Electricity Department, bringing the total to 516,851 kW. Applications for supplies (including additional supplies) numbered 2,444, representing a total of 4,458 kW. There were 218 new cookers connected making a total of 10,560 now on circuit, while orders received for the hire of cookers numbered 209.

Margate.—INVESTIGATION INTO CHARGES.—The Town Council has engaged an expert to investigate the possibility of a reduction in electricity charges by the Isle of Thanet Electric Supply Co., and also to advise on the future of the electricity undertaking on the expiration of the agreement with the company in 1938.

Nelson.—FREE DOMESTIC APPLIANCES.—A sub-committee of the Electricity Committee has been appointed with full authority to make such arrangements as it deems advisable for the free issue to consumers of electric radiators and other small appliances.

New Zealand.—TRANSMISSION CABLE REPLACEMENT.—The Central Hawks Bay Power Board has decided to replace all its copper-clad steel wires on account of the rapid deterioration which has occurred in this material. The consulting engineers recommend the use of steelcored aluminium.

INCREASED USE OF ELECTRICITY.—According to a return recently issued by the Government Statistical Department, the total output of the hundred generating stations in New Zealand during the fiscal year ended March last amounted to 1,072,346,339 kWh as compared with 1,039,358,371 kWh in 1930-31, and 1,000,080,889 kWh in 1929-30.

Northern Ireland.—PORTRUSH.—The Urban District Council is to extend mains at a cost of £580.

North Berwick.—CHEAPER ELECTRICITY.—As from January 1st, the lighting flat rate will be reduced from 9d. to 8d. per kWh and slot meter supplies from 9½d. to 8½d. The combined rate (one meter tariff) has been extended as follows :—Primary rate, 8d. per kWh for an assessed " block " of kWh depending on the size of house. Secondary rate, 3d. per kWh up to double the number of kWh in the primary block, with a third rate of 1d. for energy above this amount. This extension of the combined rate is to take the place of the two-part tariff which will be discontinued, experience having proved that a two-part tariff is unsuitable for a seaside resort where the majority of houses are only partly occupied, or occupied at all, for a short portion of the year.

The new Parliament building for the Northern Ireland Government, floodlighted by Siemens equipment and lamps on the occasion of the official opening by the Prince of Wales

Penrith.—ELECTRICITY SCHEME NEARLY COMPLETED.—The scheme for providing the town with electricity from the grid is rapidly nearing completion, and a supply is expected to be available within a few weeks.

Ravensfield.—NEGOTIATIONS FOR SUPPLIES.—Steps are being taken to secure a supply of electricity for Ravensfield and the Moorlands from the Electrical Distribution of Yorkshire, Ltd.

Reigate.—MAINS EXTENSIONS.—The Town Council has decided to extend mains to supply seventy-two houses being erected at South Park.

Rotherham.—PREPAYMENT METER SUPPLIES.—The Electricity Committee recommends a reduction of ½d. per kWh in the price of electricity for lighting through prepayment meters.

Rye.—OVERHEAD LINES.—The Rural District Council is to raise no objection to the Hastings Corporation's proposal to erect overhead lines at Pottery Lane, Brede, but desires to be heard at the inquiry concerning the proposed lines along the Military Canal from Pett to Winchelsea Beach.

Salford.—ALTERNATIVE CHARGE.—The Town Council has adopted an alternative method of payment for electricity by tenants of Council houses. The scheme provides for the payment of a weekly sum of 1s. with the rent towards the cost of electricity consumed, and this sum will be credited to the account of each tenant. Any balance over will be refunded after March 31st in each year, and any balance due will be payable quarterly.

Sandy (Beds).—EXTENSION SCHEME ABANDONED.—The Urban District Council has abandoned a proposal to provide electricity for the outlying parts of its area.

Southend-on-Sea.—UNDERTAKING'S REMARKABLE PROGRESS.—Some interesting facts regarding the advance made by Southend's electricity undertaking during recent years were given by Mr. A. C. Johnson, the borough electrical engineer, at the recent annual dinner of the Electricity Department. Three years ago sales of electricity amounted to 7,500,000 kWh; this year, said Mr. Johnson, there would be an extra 5,000,000 kWh sold—an increase of thirty per cent. Furthermore, supply costs had declined during this period from £200,000 to £190,000. Mr. Johnson also made reference to a proposal to introduce a scheme of illuminations next year on a scale similar to that at Blackpool.

Spalding.—A PETITION FROM WESTON.—The Urban District Council has received a petition with twenty-five signatures asking for a supply of electricity to Weston. The extension would cost about £871, and the Council requires a guarantee of an annual revenue of £174 per annum for the first three years.

Stockton-on-Tees.—ASSISTED WIRING.—The Electricity Committee has arranged for assisted wiring in various streets at a cost of £5,066.

LOAN SANCTIONED.—Sanction has been obtained to a loan of £10,000 for mains and services.

Tunbridge Wells.—LOAN SANCTIONED.—The Council has received sanction to a loan of £9,105 for h.p. mains.

Tynemouth.—FREE LAMPS.—For a period of twelve months two free lamps are to be given to prepayment meter consumers, as it has been found that where free lamps are given a marked increase in consumption of electricity has resulted. The cost of supplying the lamps is estimated at £440.

FURTHER CONCESSIONS.—An additional 2½ per cent. discount (making a total discount of 7½ per cent.) for cash is to be allowed to ordinary lighting consumers and the number of hours in the shopkeepers' maximum demand system, whereby electricity is obtained at 2d. per kWh after 220 hours' use, is to be reduced to 200 hours' use per quarter.

Ulverston.—EXTENSIONS.—The Urban District Council has approved a proposal to extend cables to supply houses in the Honeypot district.

Walsall.—ASSISTED WIRING.—The Electricity Committee is to apply for sanction to a loan of £10,000 for the assisted wiring scheme.

MAINS EXTENSIONS.—Mains extensions costing £4,764 are to be undertaken.

West Ham.—EXTENSIONS.—The expenditure of £66,000 on transformers and rental wiring is proposed by the Electricity Committee.

Wolverhampton.—SUPPLY IMPROVEMENTS.—The Electricity Committee is to improve the pressure in the Cannock Road area at a cost of £600.

EXTENSIONS.—A supply to the Claregate Estate is to be provided at a cost of £715.

Worcester.—CHRISTMAS LIGHTING.—Until December 24th the City Council is supplying electricity for late shop window lighting at a rebate of 2¾d. per kWh (the difference between the ordinary lighting and special late window lighting rates), provided the lights are kept on until 10.30 p.m. each week-day.

Traction

Brighton.—RE-LAYING OF TRACK.—The tramway track is to be re-laid in New England Road. A proposal to double the track from the centre of the Middle Railway Approach to the Seven Dials at an extra cost of £700 has been rejected by the Town Council on the grounds that sooner or later the tramway system would be abolished and that the double track would be a hindrance to traffic.

Burnley.—JOINT TRANSPORT CONTROL.—The consideration of the proposal to establish a joint committee to control the transport undertakings of Burnley, Nelson, and Colne is to be deferred until next month.

Dundee.—HALFPENNY FARES.—Halfpenny fares have been introduced on Corporation trams.

Germany.—RAILWAY ELECTRIFICATION.—During this month the electrification of the 40-km. section of the German State Railways from Hirschberg to Landeshut *via* Schmiedeberg will be completed. The narrow-gauge railway, which is owned by a private company, and runs between Zillerthal-Erdmannsdorf and Krummhübel, will take over electric traction next year.

Ilford.—BETTER TRANSPORT FACILITIES WANTED.—A meeting of Ilford residents was held on Monday to protest against "the totally inadequate service" provided by the L.N.E.R. between Ilford and London. A communication from the railway company stated that the present "bottle-neck" at Liverpool Street Station would not permit the running of more trains even if the line were electrified, and the construction of a tube railway from Romford to Liverpool Street at a cost of £12,000,000 would give only a meagre return on the capital expenditure.

Italy.—SPEEDING UP ELECTRIFICATION.—The electrification of the Italian railways, which was energetically taken in hand about four years ago, is now to be accelerated by the assignment of a sum of 1,200,000,000 lire for the execution of further work during the next four years.

London.—AMBER LIGHTS TO STAY.—Mr. Pybus, Minister of Transport, stated in the House of Commons last week that the Departmental Committee on Traffic Signs had reached the conclusion that the amber light should be retained. A fortnight's experiment without the amber light has recently been made in Oxford Street and at the junction of Sloane Street and Pont Street.

Middlesbrough.—TRAFFIC SIGNALS.—The Watch Committee is considering a proposal to install traffic signals in various parts of the town.

Sweden.—UNDERGROUND RAILWAY FOR STOCKHOLM.—Stockholm's first underground railway, connecting some of the southern suburbs with the centre of the city, is now under construction. The last partition wall in the tunnel was demolished on December 1st, and it is expected that the railway will be completed by the beginning of next October.—*Reuter.*

Wallasey.—TRAMWAY ABANDONMENT.—As a stage in a five years' plan for the abandonment of the tramways the Tramways Committee proposes to substitute buses for trams on the Rake Lane route at the end of the year.

Communications

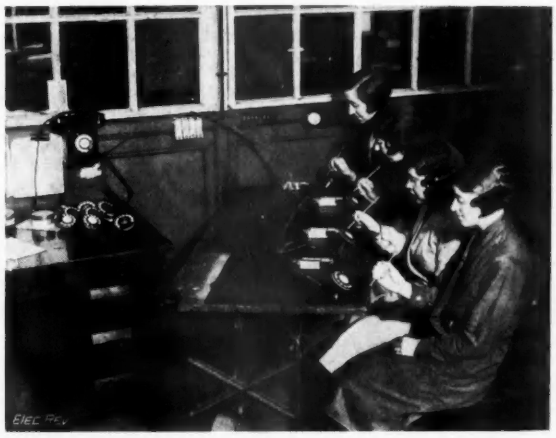
Australia.—LICENCES FOR WIRELESS SETS ON APPROVAL.—Owing to irregularities when wireless dealers have installed receivers for demonstration to prospective purchasers, the Postal Department has issued a statement making the conditions clear. A receiver can be installed in the home of a prospective purchaser on approval for three days in the metropolitan area before a licence need be taken out, and for six days in country districts. In special circumstances the period may be extended to one or two weeks. If a licence is not obtained on the expiration of the period, the owner of the equipment, or the occupier of the premises, becomes liable to prosecution. Traders infringing the conditions are also liable to prosecution.

Great Britain.—RADIO RELAY EXCHANGES.—There has been a sequel to the decision of the Newton Abbot Urban District Council to enter into negotiations with the Broadcast Listeners' Service, Ltd., for the establishment of a relay service, and local radio dealers have asked the Council to postpone negotiations and receive a deputation from them.

Wolverhampton Corporation is to enter into an agreement with Midland Rediffusion Service, Ltd., for the installation of wireless apparatus in Corporation houses

Cardiff Highways Committee has received applications from Radio Central Exchanges, Ltd., and Wired Wireless, Ltd., for permission to install relay services in the city.

Barrow-in-Furness Corporation has been informed that Barrow Radio, Ltd., proposes to operate a two-programme system.



These four girls employed by the Automatic Electric Co. have just completed a three-weeks' task of "stabbing" four automatic telephone dials a total of 970,000 times as a means of testing apparatus for a big South African contract

The Witham Urban Council has decided not to grant facilities for crossing streets with wires for a broadcast relay service.

The Newhaven Urban Council has deferred consideration for a month of an application by Barnett & Fassett, of Shoreham, for permission to install a relay scheme.

The Wealdstone U.D.C. is considering applications from Wembley Relay Service, the National Broadcast Relay Company of Bocking, Essex, and the Broadcast Listeners' Service, Ltd., London,

India.—EMPIRE BROADCASTING SERVICE.—How far it is possible to take advantage of the Empire broadcasting service is now being widely discussed in India. The Bombay and Calcutta stations were both built for comparatively local distribution only, and there arises therefore the question whether they should be equipped with long-range transmitting apparatus or whether the broadcasting organisation should be expanded for the establishment of more short-range stations like the existing ones. An argument in favour of the latter plan is that it would be a comparatively simple way of overcoming the language difficulty. When the Government purchased the Indian Broadcasting Co. it did not mean to attempt any development owing to financial difficulties. There has, however, recently been a great increase in the number of wireless receivers in the country, and if the service is now put on a sound footing and advertised as a business concern it is very likely to be profitable, says our correspondent in India.

Spain.—TELEGRAPH CONVENTION.—The International Radiotelegraph Conference, which commenced in Madrid three and a half months ago, ended on December 9th. Russia has decided to accept, with reservations, the resolutions passed at the conference. They will be embodied in a single convention and come into force on January 1st, 1934. English has been adopted as an official language as well as French. For broadcasting the long waveband has been extended, being now from 1,131 to 1,875 metres, and allocation of wavelengths to countries will take place at a conference to be held in May, 1933, probably at Lucerne. Medium-wave broadcasters are not to exceed 100 kW and long-wave stations 150 kW.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Arbroath.—December 19th. Town Council. Various works (including electrical) at housing scheme. Messrs. Carver & Symon, architects, 11, Brothock Bridge, Arbroath (deposit £1 1s.).

Australia.—MELBOURNE.—January 24th. Post and Telegraph Department. Resistances and reactances. (A. 11596.)*
January 3rd. Vitreous enamelled carbon resistances. (A.X. 11628.)*
January 17th. Automatic telephone relay sets. (A. 11618.)*
January 31st. Telephone registers and induction coils. (A. 11619.)*

Egypt.—CAIRO.—February 7th. Ministry of the Interior. Power station of about 660-kVA capacity. (A.X. 11599.)*

Fareham.—Electricity Department. 100-kVA 11,000-V three-phase transformer. (See this issue.)

Glasgow.—December 22nd. Cleansing Department. Switchboard, main control panel and cables for extension of battery charging plant at the new garage at the refuse power works. Director of cleansing, 20, Trongate, Glasgow.

Hull.—Telephone Committee. Telephone cable and loading coils. (December 9th.)

Isle of Man.—January 9th. Electricity Board. 33-kV transmission lines and pole-mounted switchgear. (See this issue.)

Lanark.—December 20th. County Council. Electric lighting and other works in connection with housing schemes. Mr. P. C. Smith, county housing and town planning engineer, 13, Clydesdale Street, Hamilton.

London.—ISLINGTON.—January 20th. Electricity Department. Electrical and engineers' stores. (See this issue.)

Menston (Leeds).—December 19th. Electric lighting installation at Mental Hospital. Mr. R. Maxwell Bond, clerk to the Mental Hospitals Board, Wakefield (deposit £1).

New Zealand.—WELLINGTON.—January 10th. Post and Telegraph Department. 10,000 telephone transmitters. (A.X. 11587.)*
January 23rd. Twenty miles of v.i.r. wire. (A.X. 11609.)*
February 7th. 800 bell receivers and 5,000 mouthpieces. (A.X. 11627.)*
February 7th. 600 keys and 200 lamp caps. (A. 11626.)*
AUCKLAND.—January 16th. Electric Power Board. Negative traction booster. (A.X. 11623.)*

Salford.—December 30th. Electricity Department. H.p. automatic voltage regulating equipment. (See this issue.)

South Africa. — JOHANNESBURG. — December 22nd. City Council. 660- and 6,600-V cables. (A.X. 11607.)*

Swansea.—January 19th. Electricity Department. Condensing plant for Tir John North power station. (See this issue.)

Walton-upon-Thames.—January 9th. Urban District Council. Transformer kiosk, switchgear, fuse units and cables. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barrow-in-Furness.—Electricity Committee. Accepted. Street lighting fittings (£165).—Revo Electric Co., Ltd. Electric cookers (£261).—Credenda Conducts Co., Ltd.

Bootle.—Watch Committee. Recommended. Traffic signals (£313).—Automatic Electric Co., Ltd.

Brighton.—Corporation. Accepted. Lamps for street lighting for twelve months (£1,241).—British Electric Transformer Co., Ltd.
Watch Committee. Recommended. Traffic signals (£4,940).—Automatic Electric Co., Ltd.

Crayford.—Urban District Council. Accepted. Wiring houses for electric lighting (£781).—C. Pamphilon.

East Ham.—Works Committee. Accepted. Traffic signals.—Automatic Elec. Co., Ltd. (£1,057); Chance Bros. & Co. (£188); I. R. S., Ltd. (£164).

Exeter.—Electricity Committee. Accepted. Switchgear for Southernhay central sub-station (£2,161).—New Switchgear Construction Co., Ltd.

Glasgow.—Corporation Housing Committee. Accepted. Electrical installations at Madras Street rehousing scheme (£264), and Trossachs Street rehousing scheme (£221).—R. J. Sinclair, Ltd.
Baths Committee. Accepted. Electrical work required in the construction of Richmond Park Baths and Washhouse (£626).—H. M. Fulton.

Kendal.—Town Council. Accepted. Cables (£718).—British Insulated Cables, Ltd.

Lancaster.—District Joint Hospitals Board. Accepted. Electrical installation and fittings for the new isolation hospital.—Messrs. Simpson.

London.—L.C.C. Central Public Health Committee. Wiring and fittings for electric lighting, power and telephones at Hackney hospital. T. Clarke & Co., Ltd. (accepted), £1,389; Electrical Installations, Ltd., £1,434; Read & Partners, Ltd., £1,480; Tredegars, £1,494; A. Dean & Co., Ltd., £1,502; H. J. Cash & Co., Ltd., £1,516; Pinching & Walton, £1,584; Gillham & Jones, £1,587; G. E. Taylor & Co., £1,691; Ellis & Ward, Ltd., £1,730.
Automatic telephone systems at St. Andrew's Hospital, Bow (£1,042), and St. Leonards Hospital, Shoreditch (£1,142).—L. G. Tate & Co., Ltd.
HACKNEY.—Works Committee. Recommended. Replacing battery in an electrical vehicle (£222).—Chloride Electrical Storage Co., Ltd. Traffic signals (£146).—Laurence Scott & Electromotors, Ltd.
Baths Committee. Recommended. Electrically driven centrifugal pump at the Central Baths (£83).—Bell Bros., Ltd.
Electricity Committee. Recommended. Improvements to condensing plant (£536).—Hick, Hargreaves & Co., Ltd.
ST. MARYLEBONE.—Electric Supply Committee. Recommended. 6,600-V switchgear (£22,268).—Ferguson, Pailin, Ltd.

Sleaford.—Electricity Committee. Accepted. Meter testing panel (£118).—Ferranti, Ltd.

Wolverhampton.—Electricity Committee. Accepted. Two 46-kVA static balancers.—English Electric Co., Ltd.

Forthcoming Events

Birmingham Electric Club.—Friday, December 16th. Grand Hotel, Birmingham. 7 p.m. Annual meeting.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, December 17th. Visit to School of Mines, Treforest. "Underground Lighting, with special reference to Miners' Hand Lamps." Mr. R. H. Campin. Smoking concert and supper at New Inn, Pontypridd.

Institution of Electrical Engineers.—Monday, December 19th. Institution, London. 7 p.m. Informal meeting. Discussion on "House Wiring Simplification and Elaboration." Opened by Mr. F. C. Raphael. (*North-Eastern Centre.*)—Friday, December 16th. Old Assembly Rooms, Newcastle-upon-Tyne. 7 p.m. Annual dinner and dance. (*London Students' Section.*)—Friday, December 16th. Institution, London. 7.0 p.m. Students' lecture. "Switchgear." Dr. C. C. Garrard. Saturday, December 17th. 3 p.m. Visit to Mayfair Automatic Telephone Exchange, W. (*North-Western Students' Section.*)—Saturday, December 17th. 2.30 p.m. Visit to Central Fire Station, Manchester. (*Western Centre.*)—Monday, December 19th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Electricity in Mines." Mr. A. R. Cooper. (*West Wales (Swansea) Sub-Centre.*)—Tuesday, December 20th. Electricity Offices, Swansea. 6 p.m. Mr. Cooper's paper. (*Tees-side Sub-Centre*).—Thursday, December 22nd. Cleveland Technical Institute, Middlesbrough. 7 p.m. Mr. Cooper's paper.

Association of Supervising Electrical Engineers.—Tuesday, December 20th. Junior Institution of Engineers, London. 7.15 p.m. "Long Distance Railway Electrification." Mr. J. M. Kennedy.

Paisley Association of Electrical Engineers.—Tuesday, December 20th. Y.M.C.A., Paisley. 7.30 p.m. "Electro-Metallurgical Induction Furnaces." Mr. N. R. Davis.

Institution of Welding Engineers.—Wednesday, December 21st. Institution of Mechanical Engineers, London. 7.45 p.m. "The Essentials of Good Welding." Mr. A. G. Walker.

220-kV Lightning Arrestors

IN order to protect the 220-kV windings of the power transformers at the Toronto-Leaside station of the Hydro-Electric Power Commission of Ontario, lightning arrestors of the auto-valve type have been installed. Those put into operation in 1930 are of the disc type, while the two three-phase sets recently installed are of the modern porous-block type. The arrestors are rated at 268 kV, and not, as usual, at the phase-to-earth voltage; each phase leg is equipped with an automatic switch operated by a potential relay which inserts the short-circuited portion of the stack into the discharge path of the arrestor when the system voltage rises above a predetermined value. In this way, the arrestors are protected if a flash-over should occur on their gaps at such a time. The switches are closed only during the lightning season or when there is a lightning storm in the vicinity. The opening of a switch is indicated in the control room.

The Commission's *Bulletin* says that the new arrestors are extremely compact and sectionally arranged as follows:—(i) The gap is of the multiple-series type, sealed in a corrugated porcelain tube divided into three sections for structural reasons, shielded with varying diameter grading rings and protected with a simple hood covering, the whole being readily suspended.

On the earlier type of arrestor, the gap consists of two spheroids covered with a large hood. (ii) The new stack, owing to the use of porous blocks, is shorter and self-supporting, and is not stayed by strings of insulators or supported by a steel framework support. (iii) The short-circuiting disconnecting switch, in the latest type, is totally enclosed, the break taking place in the corrugated porcelain tube mounted on the top of the mechanism housing. As it is light in construction, it has considerably faster operating characteristics—about ½ sec. as compared with ½ sec. Each phase of all the arrestors is paralleled with a "spillway" gap which is set at 56 in. spacing; this setting is co-ordinated with the arrestor "ceiling" voltage, so that the majority of discharges through the arrestor will not allow the voltage at the associated "spillway" gap to rise high enough to cause it to flash over.

Notes

The Radio Manufacturers' Dinner

The annual dinner of the Radio Manufacturers' Association was held on December 7th at the Savoy Hotel. Mr. J. H. Whitley, chairman of the B.B.C., proposed "The Radio Industry," and said that in 1931 the trade had shown an increase in turnover of about 50 per cent. There had been a remarkable increase in licences, and before the tenth anniversary of the B.B.C. they had exceeded five millions. A scheme of co-operation was under discussion between the B.B.C. and the industry generally for future development, both on the side of the manufacturers and the distributors. Mr. L. McMichael, in reply, said that in ten years five million licences had been taken out, and with the growing use of electricity mains they might look forward to a still greater use of radio. The radio industry was more than holding its own in these days of national depression.

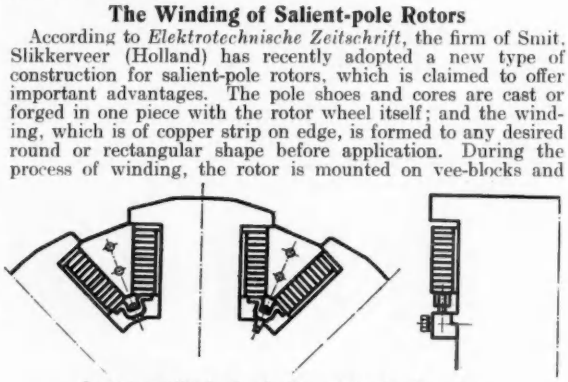
The Association of Consulting Engineers

The annual dinner of the Association of Consulting Engineers was held on December 9th at St. Stephen's Club, S.W.1. Mr. J. S. Alford (chairman of the committee) presided over a gathering of about 170 members and guests. Sir Murdoch MacDonald, responding to the toast "Engineering and the Empire," which had been briefly proposed by Mr. G. M. C. Taylor, said that without engineering there would be no Empire, and this would apply in the future as in the past. Young engineers need have no fears for the future after the present economic blizzard had passed. Professor C. E. Inglis, also responding, said that engineering was in need of a historian. The engineer was the sanest creature in creation; he had always to be judged by his deeds. On account of its engineering instincts the British nation would be more able than any other to hold its own in the future.

Mr. W. E. Tyldesley Jones proposed "The Association of Consulting Engineers." He referred to the revolution in conditions of life during the relatively short era of engineering, and to the beneficial effect of the rules of conduct and traditions governing consulting engineers. He drew a parallel between the effect on the liberties of the people of the independence of consulting engineers and of the Bar. The chairman, in acknowledging the toast, referred appreciatively to the work of the honorary officials. The hon. secretary, Mr. A. H. Dykes, was confined to his house by illness, but the latest bulletin gave good hope for an early recovery. He submitted that all consulting engineers whatever the size of their practices should join the Association.

The Winding of Salient-pole Rotors

According to *Elektrotechnische Zeitschrift*, the firm of Smit, Slikkerveer (Holland) has recently adopted a new type of construction for salient-pole rotors, which is claimed to offer important advantages. The pole shoes and cores are cast or forged in one piece with the rotor wheel itself; and the winding, which is of copper strip on edge, is formed to any desired round or rectangular shape before application. During the process of winding, the rotor is mounted on vee-blocks and



A new method of winding salient-pole rotors

each pole in turn is brought radially opposite a horizontal core or frame carrying a supply of the pre-formed copper strip. The latter is turned and bent about the flat side in such manner as to get it over the pole shoes. Insulation is then inserted and the winding is compressed and braced as shown in the accompanying illustration.

Appointments Vacant

Assistant mains engineer for Croydon Electricity Department.

Electrical engineer and manager for Haslingden Transport Department.

(See our advertisement pages to-day.)

Expansion Breakers for Locomotives

There appeared in the ELECTRICAL REVIEW of May 22nd, 1931, a description by Dr. Fritz Kesselring, of the Siemens-Schuckert expansion circuit breaker. According to the *Siemens Review* the range of these circuit breakers has been extended to cover their use in single-phase locomotives in place of oil circuit breakers. Difficulties were at first encountered in the design of expansion breakers for operation on 16⅔ instead of 50 cycles, but after much experimental work and service testing a satisfactory unit was developed. Doubts have been expressed as to the ability of expansion circuit breakers to operate at low currents, since the amount of steam generated and the consequent drop in pressure were held to be inadequate, and investigations have shown that extinction of the arc in consequence of the expansion effect alone is theoretically impossible. But with small rupturing currents the so-called "hydrogen effect" shortens the duration of the arc as the current is reduced; the point at which the expansion effect merges into the hydrogen effect corresponds to the greatest duration of the arc.

These circuit breakers are designed with a special type of drive and are claimed to effect a saving in weight of 440 to 550 lb., as compared with the corresponding oil circuit breakers, and owing to the lower stresses involved they permit the use of a lighter supporting structure for the locomotive roof. As the result of satisfactory tests the Reichsbahn-Gesellschaft have decided to employ a number of 20-kV, 60-A expansion circuit breakers on the twenty 0-4+4-0 single-phase locomotives operating on the Augsburg-Stuttgart service, the supply for which is at 16⅔ cycles.

Electric Ploughing

Major Andrew McDowall is striving to make the homeward way of the ploughman less weary. He constructed, some years ago, an electric tractor for use on his farm in East Lothian, which we described in our issue of December 18th, 1931 (p. 916.) Last week, during a discussion we had with him, we learnt that he has made a number of improvements to his machine. These include doing away with the outrigger wheel, which only existed to improve stability, and replacing the steering bobbin by a small wheel which presses against the shoulder of the last furrow; the position of the cable has also been altered, and it now hangs well over the unploughed land and therefore does not drop into the furrows. The power is taken from a home-constructed power line running along one end of the field to be ploughed and is picked up by a weighted trolley running on the lines, instead of the hook-on poles which he formerly used.

Major McDowall's farm at Mungoswells, Drem, comprises about 400 acres, and he says that he estimates the cost of ploughing at 6s. per acre (power at ¾d. per kWh), as compared with about 9s. per acre with an oil tractor. Then there is the additional advantage accruing from the side-stepping arrangements incorporated in the machine, which leaves less headland than the steam- or oil-driven plough. In spite of the fact that the present home-made model weighs about four tons it is extraordinarily easy to manipulate, as two 12½-h.p. G.E.C. motors do all the heavy work. If made commercially the cost of the machine should be about £350.

Lighting Improvements at Stationers' Hall

The way in which modern lighting can bring out hidden beauty in old buildings is demonstrated by the installation recently carried out at Stationers' Hall, Ludgate Hill, E.C.4. In place of the old cumbersome and inefficient chandeliers, forty-two "Ediswan" reflectors containing 200-W lamps have been concealed behind the historic shields which form the surround immediately above the hall's oak panelling. As our illustrations on page 891 show, the light is well diffused and shows to full advantage the colouring of the Company's banners. On one side of the hall a pleasing effect is obtained by the illumination of the stained-glass windows from outside by "Kandem" projectors containing 1,000-W lamps. The installation was carried out by the Bate Electrical Co., Ltd., under the direction of Messrs. H. Dawson & Son, architects to the Stationers' Company.

An All-electric Bakery

An all-electric bakery capable of an output of 1,400 loaves per hour has been opened at Dudley by the local Co-operative Society. The 400-V 3-phase supply mains comes into a main switchroom, from which the fourteen motors driving the machinery are operated. The motors are by the Lancashire Dynamo & Crypto, Ltd. The plant, by Baker Perkins, Ltd., is so arranged that it can be run at full pressure by nine men. The dough mixers, the sack shaker, the endless belt of the "prover," the salt and yeast whisker, the hoist, the four variety flour shaker, the endless belt conveyor through the oven, the fan, and divider, are all electrically driven. The result is a substantial economy of running costs, a smaller staff, and larger-scale production.

British Engineering Prospects in India

High hopes for a rapid recovery of India's engineering trade with Great Britain as soon as world conditions improve were held out by Sir Thomas M. Ainscough, H.M. Senior Trade Commissioner in India and Ceylon, at a luncheon of the British Engineers' Association on Tuesday. India, said Sir Thomas, had felt the "economic blizzard" to an intense degree, and her trade balance had been steadily diminishing. Increased duties had had a very serious effect on trade, and the need for economy had caused the Government to cut down very severely programmes for the development of railways, hydro-electric and other public utility undertakings. The depreciation of sterling had caused a revival in trade with Great Britain to the detriment of the United States.

Sir Thomas, in this connection, said that he viewed with considerable anxiety the recent incursion of American financial control into electrical undertakings in Western India. German trade was based largely on schemes of extended credit and the sale of cheap goods for bazaar trade. British manufacturers had an unrivalled reputation for goods and service, and the machinery industry was probably the most strongly and efficiently represented in the country. The Imperial preferences under the Ottawa agreements were of very great practical value.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. C. S. Taylor, M.I.E.E., A.M.I.E.E., vice-president and general manager of the Shanghai Power Company, who succeeded the late Mr. T. H. U. Aldridge as "chief," has retired from China after twenty-one years' service in the Far East. He will continue to act in a consultative capacity on behalf of the company, in this country, with offices at 53, Parliament Street, London, S.W.1. (Telephone: "Whitehall 7271.") Mr. Taylor, whose career was reviewed in the ELECTRICAL REVIEW of November 7th, 1930, joined the Shanghai Municipal Council Electricity Department's staff in 1913 and for some years he served as sub-station and power engineer. Thereafter he was appointed consumers' engineer.

[*Elliott & Fry*

Mr. C. S. Taylor

As our readers are aware, the business of the Department made great strides and a very big power supply demand was built up. For this and for the Department's commercial policy, much credit is due to Mr. Taylor. The undertaking passed through some interesting plant episodes during the war, but nothing could stay its progress. Mr. Taylor was appointed deputy engineer-in-chief and manager in 1922. When, in 1929, Mr. Aldridge (who passed away suddenly in May last year) came home to England to take up a position with the American and Foreign Power Company, which had purchased the undertaking from the municipality, Mr. Taylor was appointed vice-president and general manager of the Shanghai Power Co. Growth figures regarding the system have always been of interest and it may be stated that the plant capacity when Mr. Taylor joined the service in 1913 was approximately 3,000 kW; it is now 161,000 kW, and a further 25,000-kW extension is in progress. The present daily output is approximately 2,000,000 kWh with a daily maximum demand of approximately 130,000 kW.

At the head offices of the Ayrshire Electricity Board, Kilmarnock, members, ex-members, and officials of the Board paid tribute to **ex-Provost Mathew Smith,** who, owing to his retirement from Kilmarnock Town Council, automatically resigned from the chairmanship of the Board. Ex-Bailie Orr, the present chairman, presided, and presented ex-Provost Smith with an escritoire and electric radiator. He mentioned that the ex-Provost had been chairman of the Board since its constitution eight years ago.

Basil

Mr. J. H. Williams, who, as reported in our last issue, has been appointed managing director of the Marconiphone Co., Ltd.

Mr. E. A. Horner, works manager of Amalgamated Wireless (Australasia), Ltd., has arrived in this country with the object of investigating manufacturing conditions in certain lines in which his company is interested.

Mr. P. A. Spalding, of Dundalk, Louth, has retired from the position of district engineer to the Irish Free State Electricity Supply Board for the areas of Louth, Monaghan, Cavan, and Meath, and has decided to practise in future as a consulting engineer in Dundalk. Mr. Spalding in past years did much in the carrying out of electricity schemes, including those of Newry, Armagh, and Omagh, in Northern Ireland, and he is a specialist in the electrification of factories.

Mr. Adam Gowans Whyte has contributed an interesting illustrated article on "Electricity and House Planning" to the first number (November) of Town and Country Planning, a new quarterly review published under the auspices of the Garden Cities and Town Planning Association.

Mr. C. E. Hart, A.M.I.E.E., 197, Bath Street, Glasgow, C.2, has been appointed sole selling agent of Switchgear and Cowans, Ltd., for Scotland.

Mr. L. E. Wilson, A.M.I.E.E., of Messrs. L. E. Wilson & Co., Ltd., Manchester, sails for the West Indies to-morrow (Saturday) in connection with an electrification scheme. Mr. Wilson is a member of the Manchester City Council, and was recently appointed to the Electricity Committee. He is also a member of the General Purposes Committee of the E.C.A. He was responsible for the design and installation of telegraphs and telephones in the oilfields and refineries in Persia, for the Anglo-Persian Oil Co.

Mr. L. E. Wilson

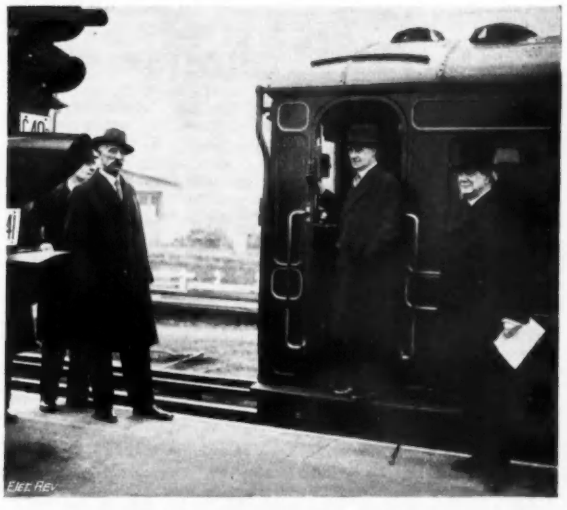
Mr. H. E. Partridge, A.M.I.Mech.E., who has been associated with John Thompson Water Tube Boilers, Ltd., Wolverhampton, for many years, has joined the board of Messrs. Mitchell Graham and Son, Ltd., Edinburgh, for the purpose of developing industrial power schemes, and this company will represent John Thompson Water Tube Boilers, Ltd., in the Scottish and North of England areas.

[*Fox Studios*

Mr. E. C. Holroyde, who has recently joined the board of Crompton Parkinson, Ltd.

A junior centre of the Institute of Post Office Electrical Engineers has been formed at Bangor, and the following officers have been appointed:—Chairman, Mr. J. H. Watkins; vice-chairman, Mr. E. W. Lettsome; hon. secretary, Mr. A. V. Williams; hon. treasurer, Mr. H. B. Hughes. Committee: Messrs. D. T. G. Jones, J. O. Jones, S. Owen, W. E. Roberts, and H. E. Thomas. Auditors: Messrs. H. O. Arridge and R. Hughes.

Col. Sir Thomas F. Purves, who, as reported in our last issue, has retired from the position of Engineer-in-Chief to the G.P.O., has been appointed managing director of United Telephone Cables, Ltd., Cable Research House, Silver Street, W.C.1. Particulars of the registration of this company were given in our issue of December 25th, 1931, p. 972, under "New Companies." The company's works are situated at Dagenham Docks, Essex, and Prescot, Lancs.



Mr. P. J. Pybus, Minister of Transport, and Lord Abercrombie, chairman of the Metropolitan Railway Co., at the opening by the former of the electrified extension from Wembley to Stanmore last Friday

Sir Alexander Gibb was to have delivered his presidential address to the Junior Institute of Engineers on December 9th, but in consequence of the retardation of his recovery from a recent accident his medical advisers forbade his attendance at the meeting and his address was, therefore, read by one of his partners, Mr. Hugh Beaver, Assoc. Inst. C.E. Sir Alexander's formal induction as president of the Institution will take place at a later date.

Our readers will learn with regret that **Mr. A. H. Dykes,** who has been honorary secretary of the Association of Consulting Engineers since its formation in 1909, was prevented by illness from being present at the Association's annual dinner on December 9th. He was taken ill with bronchitis on November 18th. Complications followed and an operation will be necessary. Although Mr. Dykes is making satisfactory progress in a nursing home, he is not expected to return to his office for about three months.

Mr. Alfred Baxter has terminated his connection with his old company, Baxter & Caunter, Ltd., and has joined the staff of the Simplex Electric Co., Ltd., at Creda House, 219, Tottenham Court Road, W.1.

Mr. H. L. Titchenor has been promoted commercial assistant to the borough electrical engineer at Reigate.

Mr. J. W. Thomas informs us in connection with our report of the Darlington case, reported in our last issue, that although we referred to him as "of the E.P.E.A.," actually he was acting in a legal capacity instructed by Messrs. Cole and Matthews, the Association's solicitors.

Miss R. England, of Barnsley, has been appointed showroom demonstrator by the Barrow-in-Furness Corporation Electricity Committee at a salary of £155 per annum, rising to £175.

Obituary

Mr. F. W. Varney.—The death is announced of Mr. F. W. Varney, London manager of Messrs. J. H. Holmes & Co., Ltd., which occurred on December 8th at the age of 60. He joined the company about forty years ago, and was appointed manager of the London office in 1915. He continued in this position upon the reorganisation of the company in 1928.

Mr. J. L. Nicholson.—We regret to learn of the death of Mr. J. L. Nicholson, managing director of the Park Royal Engineering Co., Ltd., which occurred on December 7th as the result of a motor accident. Mr. Nicholson's age was 61.

H. F. Parshall.—We regret to record the death of Dr. Horace Field Parshall, "late of Penbury Grove, Penn, Bucks," which occurred at Bayonne, on December 12th, after an operation. Dr. Parshall was born at Milford, New York, U.S.A., in the year 1865, and was thus 67 years of age. After his education at American universities, and his training as an engineer, he was connected with the Sprague, Wenstrom, and Edison-General Electric companies respectively, the last named of which consolidated with the Thomson-Houston interests. As chief designing engineer to the General Electric Co., he was closely interested in electric railway machinery, electrical machinery generally, and power station design. He was at one time a lecturer at the Massachusetts Institute of Technology, and with Mr. H. M. Hobart he was joint author of electro-technical books which are in the forefront of such works. In this country he was prominently connected with the Central London Railway, and in course of time became chairman of that company. He was also consulting engineer for various important schemes here, and had been chairman or a director of various electrical companies, including the Lancashire Electric Power Co., the Hydro-Electric Securities Corporation, and the Barcelona Traction, Light & Power Company, Ltd., but several years ago he retired from the stage of former practical electrical operations. Dr. Parshall was a member of the Institution of Civil Engineers, an M.Sc. of Lehigh University, and a D.Sc. of Tufts College. He was a prizeman of the Institution of Electrical Engineers after contributing a paper on tramway electrification. The Institution of Civil Engineers awarded him the Telford Gold Medal for a paper on hydro-electric installations in Spain, where he was directly connected with important schemes, and the Telford Prize for a paper on railway electrification. The same Institution also awarded him the Crampton prize. Dr. Parshall was a golfer and was devoted to rock gardening; indeed it is said that when he was resident at Penbury Grove, in Buckinghamshire, he had one of the finest rock gardens in existence. He leaves a son, Mr. Horace F. Parshall, who was married in 1929 to the only daughter of Lord Bledisloe.

[Press Portrait Bureau

The late Dr. H. F. Parshall

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Electrical & Radio Research, Ltd.—Private company. Registered December 9th. Capital £15,000 in 10,000 10 per cent. cumulative preference shares of £1 and 100,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in electrical and radio apparatus, machinery, plant, &c. The subscribers are: A. Paterson, Bideford, Cippenham, Bucks, and J. E. Booth, Finsbury House, Blomfield Street, E.C.2. Registered office: Finsbury House, Blomfield Street, E.C.2.

Amcolite, Ltd.—Private company. Registered December 12th. Capital, £2,000 in £1 shares. Objects: To acquire, work and develop patents and provisional patents, in particular patent No 304431 and provisional patent No. 12715, granted May 3rd, 1932, and to carry on the business of sign manufacturers, electrical and general engineers and contractors, &c. The directors are: H. Taylor (chairman), Bath Vale House, Congleton, Ches., and three others. Secretary: J. A. Johnson. Solicitors: Tomkinson, Norris & Norris, Burslem.

Pantheon Radio, Ltd.—Private company. Registered December 6th. Capital, £2,000 in £1 shares. Objects: To adopt an agreement with H. Panagakis for the purchase of his business and trade marks, and to carry on the business of wireless distributors, manufacturers of and dealers in all kinds of wireless and electrical equipment, &c. The directors are: H. Panagakis, "Beverley," Childwall Priory Road, Wavertree, Liverpool, and R. G. Kitchen, 21, Elm Vale, Fairfield, Liverpool. Registered office: 91, Dale Street, Liverpool.

A. Wiseman, Ltd.—Private company. Registered December 12th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, wireless engineers, manufacturers of wireless and electrical plant, &c. The directors are: G. G. Wiseman, 46, Half Moon Lane, S.E.24, and A. N. Burton, 15, Millbrook Road, S.W.9. Secretary: A. N. Burton. Registered office: 314, Walworth Road, S.E.17.

Returns of Electrical Companies

Ekco Radio, Ltd.—Capital, £3,000 in £1 shares. Return dated August 8th, 1932. 2,397 shares taken up. £2,397 paid. Mortgages and charges, nil.

W. E. Beardsall & Co., Ltd.—The nominal capital has been increased by the addition of £16,000 in £1 ordinary shares beyond the registered capital of £4,000.

Electric Supply Corporation, Ltd.—The nominal capital has been increased by the addition of £250,000 beyond the registered capital of £500,000. The additional capital is divided into 50,000 ordinary and 200,000 unissued shares of £1 each.

Belling & Lee, Ltd.—Issue on November 21st, of 3,000 debentures, part of a series already registered.

Northern Electrical & Ventilating Co., Ltd.—H. P. Jones, 8, Haymans Green, West Derby, Liverpool, was appointed receiver and manager by Order of Court dated November 17th.

Kalgoorlie Electric Power & Lighting Corporation, Ltd.—Capital, £50,005 in 5 preference shares of £1 and 100,000 ordinary shares of 10s. each. Return dated June 30th, 1932. All shares taken up. £3 10s. paid on 7 ordinary shares. £50,001 10s. considered as paid on 5 preference and 99,993 ordinary shares. Mortgages and charges: £87,675.

Blakoe Appliances, Ltd.—The nominal capital has been increased by the addition of £500 beyond the registered capital of £100. The additional capital is divided into 500 8 per cent. cumulative participating preference shares of £1 each.

Telegraph Construction and Maintenance Co., Ltd.—The nominal capital has been increased by the addition of £522,900 in £1 ordinary shares beyond the registered capital of £373,500. (This increase follows a recent reduction.)

G. L. Adamson, Ltd.—Capital, £7,500 in £1 shares. Return dated August 31st, 1932. 5,100 shares taken up. £600 paid. £4,500 considered as paid. Mortgages and charges nil.

Ceag, Ltd.—Capital, £1,000 in £1 shares. Return dated June 1st, 1932. All shares taken up. £1,000 paid. Mortgages and charges nil.

Walters Electrical Manufacturing Co., Ltd.—Capital, £18,000 in £1 shares. Return dated June 29th, 1932. 16,875 shares taken up. £6,875 paid. £10,000 considered as paid. Mortgages and charges nil.

Vac-Tric, Ltd.—Charge on land and buildings in Dollis Hill, Willesden, yearly payments which in 1871 amounted to £26 6s. 1d., payable out of the above, &c., dated December 2nd, to secure £7,262 6s. 7d. Holders: E. B. Nichols, 90, Cannon Street, E.C., and E. G. Tanton, 31, Park Hill, Clapham, S.W.

A. W. Penrose & Co., Ltd.—Capital, £45,000 in 10,000 1st preference, 5,000 2nd preference, and 30,000 ordinary shares of £1 each. Return dated June 1st, 1932. 10,000 1st preference, 500 2nd preference, and 30,000 ordinary shares taken up. £10,507 paid £29,993 considered as paid. Mortgages and charges, nil.

City Notes

The India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., reports a trading profit of £13,901, but after deducting the loss at the Persan works, there was a trading loss for the year of £9,386. After making provision for depreciation, &c., there was a net loss of £88,892, which with a debit balance of £123,755 brought in makes a total loss of £212,649 to be carried forward. The report states that, notwithstanding the economies effected, the trading results show a substantial reduction compared with the previous period, and that it is again necessary to provide for depreciation in the value of stocks on hand. This provision includes the writing down of stocks and obsolete stores transferred to Silvertown on the closing of the Burton works, and also of the stock of certain manufactured goods at Persan, the values of which have been affected by a heavy fall in their market prices. Other factors contributing to the loss shown were a reduction in the turnover at Silvertown, due largely to the almost complete cessation of the demand abroad for one particular product, and the continued adverse results in the Persan factory. Of the loss of £88,894, Persan, before providing for its share of head office charges and interest, was responsible for £44,780. This figure includes £4,604 for depreciation of buildings, plant and machinery, £5,113 for depreciation of stocks, and £11,776 for exchange loss arising from the depreciation of sterling. The directors have had under serious consideration the advisability of closing down the works at Persan, but stringent investigation, followed by drastic measures, has resulted in the factory being put on a basis which, unless conditions become worse, should enable it to be carried on without loss and, when trading conditions improve, become a profitable unit. The effecting of economies in both the manufacturing and selling departments, and the reorganisation of methods of production, have been continued throughout the year and are still being followed. Costs of production, both at Silvertown and Persan, have been lowered, and recent steps taken should continue the progress made in this direction. The deaths of Sir John Ferguson and Mr. C. H. Gray, and the appointment of Mr. B. H. Binder as chairman, are recorded. Meeting: December 21st.

Allen West & Co., Ltd., report that the effect of the reorganisation referred to in last year's report is only partly reflected in the accounts for the year ended July 31st, and the trading loss of £21,906 (against £31,817) was mainly incurred in the first half of the financial year before the reorganisation became fully effective. A surplus of £31,267 on the sale of an investment, after allocating an amount as reserve against remaining investments in subsidiary companies, has been credited to profit and loss. The resulting balance for the year amounted to £7,179, which, with £10,655 brought forward and £1,179 tax refunded, makes £19,727. It is proposed to place £17,000 to depreciation reserve, and to carry forward the balance. The report states that, owing to the large proportion of output which has been exported in the past, the company has been particularly affected by the collapse of the export markets in every part of the world. Although export orders decreased, the total value showed an increase over that for the preceding year. There was, however, a substantial decrease in output for the year, due to the smaller value of the unexecuted orders in hand at August, 1931, as against August, 1930. The large range of electrical equipment which the company now manufactures has contributed substantially to the increased orders received during the year.

Crompton Parkinson, Ltd.—The preliminary figures for the year ended September 30th last, published in our issue of December 2nd (p. 837), are confirmed by the report which has just come to hand. This states that having regard to the difficult conditions experienced at home and overseas the results are gratifying. The sales of the company's products continue to expand and the demand for Crompton lamps is particularly satisfactory. During the year the company acquired a controlling interest in the British Electric Transformer Co., Ltd., and Derby Cables, Ltd. The resignation of Mr. E. Reeves from the board and the appointment of Mr. E. C. Holroyde as a director are recorded.

The Midland Counties Electric Supply Co., Ltd., on December 14th, offered for subscription an issue of £700,000 of 4 per cent. debenture stock at par. The stock will be redeemed in 1962 at par, but the company has the right to make earlier repayment at varying premiums. It forms part of an issue limited in the first instance to £1,000,000 (of which £300,000 will be reserved for issue in due course to provide for the repayment at 105 per cent. of the outstanding £282,160 5 per cent. debenture stock on March 10th next), but the company is at liberty to issue further debenture stock ranking *pari passu* therewith.

The Perak River Hydro-Electric Power Co., Ltd., reports a net revenue for the year ended July 31st of £88,198, to which is added £2,358 brought in and the balance of steam station revenue for the period from December 12th, 1928, to July 31st, 1930, making a total of £123,062. From this the following payments are made: Interest on prior lien advances, £7,042; interest on guaranteed debenture stock, £60,377; guaranteed debenture stocks redemption reserve, £36,750; compensation, &c., payable on reduction of staff, £2,722. A balance of £16,170 is carried forward. The death of Mr. C. W. H. Cochrane, a member of the board, is recorded.

The Young Accumulator Co. (1929), Ltd., is to hold an extraordinary meeting on December 30th at which a resolution will be submitted for the reduction of the capital from £225,000 to £75,000 by cancelling 6s. 8d. per 10s. share. The shares are to be consolidated into shares of 10s. denomination and sub-divided into 2s. shares. The capital will then be increased to £225,000 by the creation of 1,500,000 new 2s. shares.

Yarrow & Co., Ltd., report a profit for the year ended June 30th of £18,479, as compared with £16,211 in the previous year, to which is added £18,382 brought in, making £36,861. It is proposed to place £10,000 to general reserve and to maintain the dividend at 5 per cent., leaving £19,361 to be carried forward.

The Lisbon Electric Tramways, Ltd., has announced an interim ordinary dividend of 3 per cent., net (same).

Mann Egerton & Co., Ltd., report a profit for the year ended September 30th of £12,827, as compared with £17,143 in the preceding year. It is proposed to pay a dividend of 6 per cent. on the preference shares, and to carry forward £15,245.

The Delhi Electric Supply & Traction Co., Ltd., has announced an interim dividend of 4 per cent. tax free (against 4 per cent., less tax).

Telephone Properties, Ltd., has announced the dividend on the 8 per cent. cumulative preference shares in respect of the half-year ending December 31st.

The North Metropolitan Electric Power Supply Co. has placed privately 200,000 six per cent. cumulative preference shares of £1 each. These shares rank *pari passu* with the existing shares.

The Great Northern Telegraph Co., Ltd., of Denmark, has declared an interim dividend at the rate of 5 per cent. per annum (same).

The Para Telephone Co. has announced an interim dividend of 2 per cent., less tax (against nil).

The Calgary Power Co. has declared a quarterly dividend of 1½ per cent. on the common stock.

Stocks and Shares

TUESDAY EVENING.

THE Stock Exchange markets in gilt-edged and purely investment securities have thrown off the restraint which had previously confined their optimism, and have gone ahead in most of the sections. It is a good thing to have the uncertainty of the American debt payment now removed. Many people on this side of the Atlantic agree that the payment will do this country no harm—will, if anything, raise the prestige of Great Britain's financial credit to a level even higher than that which it occupied before. On the other hand, the American citizen who is crying aloud for impetus to his personal trade and industry obtains no benefit from the transfer of metal which goes into the vaults of New York banks and safe deposits. It is predicted by a New York Stock Exchange broker, at present on a visit to London, that within a year the United States will be approaching this country with an earnest request for the international debt to be cancelled or indefinitely postponed, in order that the individual American trader shall have a chance to make a living by doing business with his customers in Great Britain.

New Issues

Many industrial companies are taking advantage of the present ease of money to reduce the interest charges on their debenture stocks, and to raise fresh money upon cheaper terms. This adds a fresh complication to the perplexities of the investor beset with the problem of obtaining a living rate of interest upon money which he cannot use in his own business. The Midland Counties Electric Supply Company is making an issue of £700,000 4 per cent. debenture stock at 100, and there is little doubt as to the issue being readily taken up. The company has paid 7 per cent. annually on its ordinary shares for three years past, and the money required for the interest service of this new issue is amply covered by earnings.

The North Metropolitan Electric Power Supply Company has placed a line of 6 per cent. cumulative preference shares of £1 each, and these are now offered in the market at 28s. 3d. free of stamp and fee. The return on the money at that price is no more than 4¼ per cent., but the company's revenues for the past ten years are so substantial as to give the preference shares a gilt-edged character. The company issued ordinary shares, it may be recalled, at 30s. in January three years ago, when shareholders were offered one new share for every four shares held, at the price of 30s. per share. The present price of the ordinary shares is 53s. 3d.

Home Railways

The Metropolitan Railway has just opened an extension to Stanmore, Middlesex, which completes work that has been going on for rather more than two years, and upon which something like half a million pounds has been spent. In pre-war days the opening of such an extension would have exercised a strengthening effect upon the price of the company's stock, but in these abnormal times it has no influence—in fact, the price of Metropolitan consolidated, at 59, is 4 points lower on the week. Districts have come down by 5, the price now being 62¼. London Electric ordinary is flat, at the same figure. Underground Electrics remain dull at 18s. The weakness of the Underground stocks is due in part to a misunderstanding of the Government's proposal that the suggested pooling arrangement shall be postponed until 1934. This, however, need not preclude the London Passenger Transport Bill from coming into immediate operation if it receives the Royal Assent in the next session of Parliament.

New York and American Difficulties

American Telephone & Telegraph shares have assumed the leadership of the securities in the dollar list. The price moves up and down each day in accordance with the fluctuating character of Wall Street moods. Business conditions in America are described by people on the spot as being better than they were six months ago, a statement which, to those conversant with the business position in the United States

last May, does not convey a great deal of exuberance. To spend a couple of hours in what is called the financial district of New York, to notice the hundreds of skyscraper offices which are not tenanted, to sympathise with the scores of folks, many decently dressed, who make up the pathetic bread lines, to meet men begging for nickels on Fifth Avenue, to observe the huge deficit which faces New York City by reason of its inability to raise the necessary rates and taxes for meeting its ordinary obligations, to feel the undercurrent of defeatism—there is no other word adequately to describe it—which pervades business circles in New York, will give, as nothing else can, a very melancholy sense of the financial position which now obtains.

New York may not be a fair criterion of American cities as a whole, but the business conditions which prevail there are undoubtedly reflected in greater or less degree throughout the whole of the United States. It may be that conditions will rapidly change, as they have done in the past, from bad to good, from pessimistic to optimistic, but the opinion of New Yorkers themselves does not flatter the hope of any immediate revival on the scale that will be necessary to reverse the current order of things.

Radio Corporation and Radio City

The General Electric Company of New York will distribute next February one share of Radio Corporation common stock for each six shares held in the General Electric of New York. The Radio Corporation is subject to severe competition from the cable companies, and there is a vague idea that, owing to the falling off of business, efforts may be made to establish a working agreement that will eliminate the present rivalry between the leading companies. An ambitious scheme called Radio City is approaching completion in the west end of New York. It is being sponsored by Mr. J. D. Rockefeller, Junr. Street urchins call it Rockefeller's Folly.

Brazilian Tractions are a little easier on the week, at 11¾, but the tendency of dollar stocks as a whole is towards slightly higher levels, though no particular feature has developed. International Telephones & Telegraphs are easier at 13, the position of the company being the subject of a good deal of interest and of speculation in New York.

Electricity Supply

It will be noticed, by reference to our share list of electrical companies, that the prices of most of the London companies' ordinary shares now stand at 33s. 6d. This applies to Bromptons, Charing Cross, Chelsea, Kensington, London Electrics and St. James'. Westminsters are quoted at 33s., City of London ordinary now stand at 34s., which is ex the rights to the share bonus just paid. The County of London and the Metropolitan Companies are situated differently from those of the London companies to which the standard rate of dividend now applies, and this is the reason why the prices of these two companies show no connection with the general run. St. James' & Pall Mall 7 per cent. preference strengthened to 30s. 6d.

Of the Provincial companies, Bournemouth & Poole are a little better at 70s. 6d., as are North-Eastern ordinary at 27s. West Gloucestershire Power preferred rose to 95½. Isle of Thanet ordinary at 20s. are a shade easier on the week. In the foreign group, Whitehall Electric at 16s. 3d. have gone back 9d. On the other hand, Tokyo Electric sixes further improved 1½ to 66½, in company with the bonds of the Japanese Government. Of the Indian shares, Delhi Electric Supply & Traction rose to 2¼ on the announcement of a 4 per cent. tax free dividend. Perak River Hydro-Electric shares are unaffected by the directors' statement that an appreciable falling off in the sales of electricity occurred during the year which ended July 31st last. A further reduction has taken place since the accounts were made up. A falling off of £40,800 in revenue was partially compensated for by economies amounting to £25,000. The company is dependent, of course, largely upon the tin industry, and when matters improve in the metal market the undertaking will have a fair chance of showing its capacity for earning profits. The ordinary shares are quoted at 2s. 3d. and the 7 per cent. participating debentures at 22½. But the 5 per cent. debenture stock is guaranteed by the British Government, and is difficult to buy under 110.

Manufacturing and Equipment

The Telegraph Construction & Maintenance Company, Limited, is returning, on the Friday in this week, £7 per share by way of return of capital, and is distributing, in addition, five ordinary shares of £1 each in respect of the former £12 shares. This rounds off the plan passed at the meeting of the company held last June for the reduction of capital and subdivision of shares. The latter, in their new £1 shape, are quoted at 16s. 3d. Telephone Properties, the new name for Venezuela Telephones, are firmer at 20s. International Automatics have risen to 40s., Telephone Rentals to 5s. 10½d. Marconi Marines at 32s. are 6d. lower. Cables & Wireless stocks show a tendency to droop.

Crompton Parkinson's accounts make a good showing, but as already announced, the dividend on the ordinary and the "A" ordinary shares is slightly lower at 22½ per cent., comparing with the rate of 24 per cent. per annum distributed in respect of the previous eighteen months. The price of the ordinary shares has gone back to 21s. 3d. The 8 per cent. preference remain steady at 30s. Ever-Ready shares are a little easier at 26s. 6d.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price, Dec. 13.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	70/6	+6d.	4 4 9
Brompton Ordinary	1	8½	8½	33/6	+6d.	4 3 7
Central Electricity 4½% Deb.	Stock	4½	4½	104	−1	4 5 9
Charing Cross Ordinary	1	8½	8½	33/6	—	4 3 7
Chelsea	1	8¾	8¾	33/6	—	4 3 7
City of London	1	10	10	34/-xr.	—	4 2 4
Clyde Valley	1	8	7	32/-	—	4 7 9
County of London	1	11	10½	50/-	—	4 4 0
Edmundsons' 7% Pref.	1	7	7	30/-	—	4 13 4
Elec. Dis. Yorkshire	1	9	9	41/3	—	4 7 4
Elec. Supply Corporation	1	11	11	55/-	—	4 0 0
Kensington Ordinary	1	8	8	33/6	—	4 3 7
Lancs. Light and Power	1	6½	7	29/3	—	4 15 9
London & Home Counties 4½% Deb.	Stock	4½	4½	107	—	4 4 0
London Electric	1	9	9	33/6	—	4 3 0
Metropolitan	1	10	10	46/-	—	4 7 0
Midland Counties	1	7	7	33/3	—	4 4 2
Mid. Elec. Power	1	8	8	34/6	−⅛	4 12 9
North Eastern Electric Ordinary	1	6	6	27/-	+6d.	4 9 0
Do. 7% Pref.	1	7	7	31/-	—	4 10 1
Northampton	1	10	10	48/-	—	4 3 4
Notting Hill 6% Pref.	10	6	6	12¾	—	4 14 0
North Met. Elec. 6% Pref.	1	6	6	29/-	—	4 2 9
St. James' and Pall Mall	1	8	8	33/6	—	4 3 7
Scottish Power	1	8	8	33/9	—	4 14 10
South London	1	8½	8½	33/-	—	4 4 10
Urban Ordinary	1	7	7	33/9	—	4 3 3
Westminster Ordinary	1	8½	8½	33/-	—	4 4 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	16/3	—9d.	9 4 8
Yorkshire Elec.	1	8	8	39/-	—	4 2 0
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	82½	—	4 17 0
Metropolitan	„	3½	2½	59	—1	4 4 9
Do. District	„	5	4½	62½	—5	7 4 0
Underground Electric	1	8	7	18/-	—	7 15 7
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	165½	+5½	5 8 10
Anglo-Am. Tel. Pref.	Stock	6	6	105½	—	5 13 9
Do. Def.	„	1½	1½	26	—	5 15 5
Cables & Wireless 5½% Pref.	„	5½	2¾	78½	—	3 10 1
Do. A 7½% Ord.	„	—	Nil	28	−½	—
Do. B Ord.	„	—	Nil	12	−½	—
Globe Tel. and T. Ord.	10	8½	Nil	11½	—	—
Do. do. Pref.	10	6	6	11½	—	5 7 7
Great Northern Tel.	10	20	20	27½	—	7 5 6
Marconi-Marine	1	15	10	32/-	—6d.	6 5 0
Oriental Telephone Ord.	1	12	12	2½	—	*4 1 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	—	—	4/6	—	—
Do. do. 2nd Pref.	5	—	—	3/9	—	—
Do. do. 5% Deb.	Stock	—	—	7	—	—
British Electric Traction Def. Ord.	„	5	5	275	—	—
Do. do. Pref. Ord.	„	8	8	132½	—	6 0 9
Brazil Traction	100	—	—	11¾	−¼	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	101½	—	4 18 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	12/-	—	—
London United Tram Deb.	Stock	4	4	67½	—	5 19 5
Mexico Trams, 5% Bonds	—	5	5	45	—	11 2 2
Mexican Light Common	100	Nil	Nil	10	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	72½	—	6 18 0
Victoria Falls Ord.	1	15	15	77/6	—	3 17 4
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	30/-	—	5 6 8
Babcock & Wilcox	1	14	14	38/3	—	—
British Aluminium Ord.	1	10	5	21/6	—	4 1 8
British Insulated Ord.	1	15	15	65/-	—	4 12 1
Brush Ord.	Stock	5	Nil	40	—	—
Callender's	1	15	15	3⅛	—	4 18 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 6
Crompton Parkinson Ord.	5/-	30	24	21/3	—9d.	5 8 0
Do. 8% Pref.	1	8	8	30/-	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	+3d.	6 2 5
Do. 5% Deb.	Stock	5	5	100	—	5 0 0
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	4⅞	—	5 12 7
English Electric	1	Nil	Nil	9/6	—	—
Do. do. Pref.	1	Nil	Nil	14/-	—	—
Ever Ready	5/-	35	35	26/6	—6d.	6 12 1
Ferranti Pref.	1	7	7	23/6	—	5 19 2
G.E.C. Pref.	1	6½	6½	29/-	—	4 9 8
Do. ord.	1	10	8	39/6	—6d.	4 2 0
Henley's	1	30	30	6⅛	—	4 19 0
Do. 4½ Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/9	—	—
Johnson & Phillips	1	10	5	1	—	5 0 0
Siemens Ord.	1	7½	7½	24/6	—	6 2 5
Telegraph Construction	£1	Nil	Nil	16/3	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

2163. "Gas-filled electric discharge tubes." W. L. W. Schallreuter. November 23rd, 1931. (383,641.)

16324. "Electric discharge devices." British Thomson-Houston Co., Ltd., and J. A. V. Fairbrother. June 4th, 1931. (383645.)

21712. "Telephone systems." Automatic Electric Co., Ltd., and G. T. Baker. July 29th, 1931. (383659.)

21797. "Electrical rectifying plant." Allgemeine Elektricitäts Ges. July 30th, 1930. (383639.)

22410. "Coils, particularly for loudspeakers." Kolster-Brandes, Ltd., M. S. Hobam, and F. R. W. Strafford. August 7th, 1931. (383664.))

23159. "Metal-vapour valves." Akt.-Ges., Brown, Boveri et Cie. September 2nd, 1930. (383667.))

23166. "Wireless signalling systems." Hazeltine Corporation. September 10th, 1930. (383668.)

24097. "Electric signalling or indicating instruments." Hopkinsons. Ltd., R. A. Hopkinson, and W. B. Dale. August 27th, 1931. (383672.)

24139. "High-frequency signalling systems." British Thomson-Houston Co., Ltd. August 27th, 1930. (383673.)

24152. "Dynamo-electric machines." Siemens-Schuckertwerke Akt.-Ges. September 15th, 1930. (383674.)

24657. "Electric evaporators." Dr. E. Silten (trading as Dr. E. Silten Fabrik Chem. Pharmac. Praeparate), and H. Herzogenrath. September 2nd, 1931. (383677.)

24743. "Electrical wave-filters." General Electric Co., Ltd., and D. C. Espley. September 3rd, 1931. (383678.)

26687. "Alternating current rectifying systems." British Thomson-Houston Co., Ltd. September 25th, 1930. (383693.)

27039. "Flexible electric cord-suspender standard." F. Greathead. September 29th, 1931. (383697.)

27089. "Sound-reproducing instruments, principally loudspeakers." F. H. Lawrence. September 29th, 1931. (383698.)

27486. "Switchgear for aerial-electric transmission lines." W. H. Turner and W. H. Isherwood. October 3rd, 1931. (383705.)

27719. "Gramophones and loudspeakers." J. Roston and Linguaphone, Ltd. October 6th, 1931. (Patent of addition not granted.) (383708.)

28136. "Circuit arrangements for combined telegraph and telephone installations." C. Lorenz Akt.-Ges. November 15th, 1930. (383713.)

28305. "Electric contact devices." Tyer & Co., Ltd., and T. W. Ballard. October 12th, 1931. (383715.)

28329. "Telephone and like transmission systems." Telefonaktiebolaget, L. M. Ericsson. October 13th, 1930. (Addition to 369984.) (383716.)

28982. "Electric cookers." H. E. Rhodes. October 19th, 1931. (383719.)

31500. "Tap-changing apparatus for electric transformers." H. Dingle. November 13th, 1931. (383742.)

32292. "Intercommunicating telephone systems." Ericsson Telephones, Ltd., and W. E. Hunt. November 21st, 1931. (Cognate application 13316/32.) (383747.)

33312. "Cathode-ray apparatus." British Thomson-Houston Co. Ltd. December 1st, 1930. (383752.)

34099. "Electric heaters." G. Bray & Co., Ltd., and G. Bray. December 9th, 1931. (383760.)

34137. "Electrically operated indicating mechanisms." General Electric Co., Ltd., and W. R. Rose. December 9th, 1931. (383761.)

35461. "Construction of television and like apparatus." F. J. Bingley, and Baird Television, Ltd. December 22nd, 1931. (383771.)

1932

499. "Electric steam-generator, and method of controlling same." F. T. Kaelin. January 7th, 1932. (383783.)

500. "Electric steam-generators." F. T. Kaelin. January 7th, 1932. (383784.)

1054. "Selectors for telephone exchanges." F. Merk, and Fuld & Co. Telephon und Telegraphenwerke Akt-Ges. May 1st, 1931. (383790.)

1154. "Panel selectors for telephone exchanges." F. Merk, and H. Fuld & Co. Telephon und Telegraphenwerke Akt.-Ges. May 2nd, 1931. (383794.)

2612. "Method of and arrangement for production of amplification of oscillations by means of gas-discharge amplifier valves." Telefunken Ges. für Drahtlose Telegraphie. January 28th, 1931. (383807.)

3489. "Electrical apparatus for the transmission of orders or signals." Soc. Anon. des Etablissements E. Regnier. February 5th, 1931. (383812.)

4215. "Plugs for electric plug-and-socket connections." C. H. Parsons, Ltd., and G. B. Handley. February 12th, 1932. (383815.)

6024. "Gear-changing device, more particularly for use in electrical apparatus." Landis & Gyr Akt.-Ges. March 18th, 1931. (383829.)

6104. "Pick-up arms for electrical gramophones and the like." International General Electric Co., Inc. February 27th, 1931. (383831.)

6949. "Electric connectors." British Thomson-Houston Co., March 9th, 1931. (383839.)

7186. "Holders for use in electroplating." B. J. R. Evans and Imperial Chemical Industries, Ltd. March 10th, 1932. (383841.)

7416. "Electrically depositing metals." B. J. R. Evans and Imperial Chemical Industries, Ltd. March 12th, 1932. (383842.)

8784. "Arc lamps." E. A. Lennox. March 24th, 1932. (383853.)

9151. "Electric discharge apparatus." British Thomson-Houston Co., Ltd. March 30th, 1931. (383858.)

9390. "Electrical welding of metals." E. Bornand and H. A. Schlaepfer. April 6th, 1931. (383859.)

9760. "Multiple-conductor squirrel-cage induction motors." E. Shigyo. April 5th, 1932. (383861.)

9797. "Luminous electric discharge tubes." General Electric Co., Ltd. May 15th, 1931. (383862.)

9844. "Electric lighting systems and lamps for vehicles." R. Bosch Akt.-Ges. April 8th, 1931. (383863.)

10306. "Induction furnaces." Heraeus Vacummschmelze Akt.-Ges. and W. Rohn. April 15th, 1931. (Addition to 22800/31.) (383864.)

11583. "Spark plugs." Champion Spark Plug Co. January 29th, 1932. (383875.)

12129. "Electromagnetic oscillating device with freely oscillating armature." British Goldring Products, Ltd. January 29th, 1932. (383879.)

12194. "Television method." M. Von Ardenne. April 29th, 1931. (383880.)

13623. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd. June 30th, 1931. (383889.)

13839. "Panel selector arrangement in telephone installations." F. Merk and Fuld & Co. Telephon und Telegraphenwerke Akt.-Ges. May 18th, 1931. (383892.)

13840. "Flat-bank multiple for selector in telephone installations." F. Merk and Fuld & Co. Telephon und Telegraphenwerke Akt.Ges. May 20th, 1931. (383893.)

17400. "Devices for transmitting high or medium frequency oscillations along power supply circuits." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 19th, 1931. (383908.)

17441. "Mercury-vapour rectifiers." Akt.-Ges. Brown, Boveri et Cie. June 20th, 1931. (383909.)

18141. "Protective devices for electric transmission systems." British Thomson-Houston Co., Ltd. June 26th, 1931. (383914.)

18882. "Electric lamps for use in immersion in water or other fluid medium under pressure." Sir R. H. Davis. July 4th, 1932. (383919.)

19250. "Acoustic diaphragms." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 14th, 1931. (383921.)

20324. "Wireless communication." Soc. Francaise Radioelectrique. July 29th, 1931. (Addition to 270749 and 372090.) (383928.)

20514. "X-ray installation." C. H. F. Muller Akt.-Ges. July 24th, 1931. (383929.)

20726. "Electric welding apparatus." British Thomson-Houston Co., Ltd. July 22nd, 1931. (383930.)

20819. "Liquid-break electric switches of the explosion chamber type." International General Electric Co., Inc. July 23rd, 1931. (383931.)

20963. "Electric furnaces." British Thomson-Houston Co., Ltd. July 24th, 1931. (383932.)

24420. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 24th, 1931. (383945.)

24840. "Picture analysing and composing discs, more particularly for television purposes." Fernseh Akt.-Ges. September 12th, 1931. (383946.)

25188. "Multiple tariff meter for alternating current." Landis & Gyr Akt.-Ges. September 24th, 1931. (383947.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 7th :—

Prosana. No. 535748. Class 6. Electrical machines for permanently waving the hair.—Osborne, Garrett & Co., Ltd., 51-54, Frith Street, W.1.

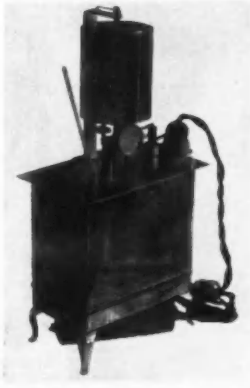
Insulus. No. 529879. Class 50. Electrical insulating varnishes.—J. Dampney & Co., Ltd., Britannia Works, Portland Road, Newcastle-on-Tyne.

Cygnet. No. 534391. Class 50. Insulating parts of electrical fittings, all made of synthetic resin.—Edison Swan Electric Co., Ltd., 123-125, Queen Victoria Street, E.C.4.

Temperature Tests of Moulded Insulating Material

The machine illustrated has been developed especially to comply with the requirements of the American Society for Testing Materials Specifications for gauging the temperature withstanding qualities of moulded insulating material.

A standard test piece 5 in. long and ½ in. square in section is placed on steel supports 4 in. apart and a load of either 2½, 5, or 10 kg. is applied as necessary. The specimen is enclosed in an air bath surrounded by an electrically heated oil bath whose temperature is gradually raised. The deflection at the centre is measured in millimetres, and when this amounts to 0.254 mm. (ten thousandths of an inch) the temperature registered by the maximum thermometer shown is taken as the distortion point, at which point the heating circuit is automatically broken and a warning signal is given by the machine.



A Westinghouse machine for testing moulded insulating materials

Cold transverse tests on the standard size specimen are made with an ordinary universal testing machine, the general details of this apparatus being similar to that of the temperature testing machine.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (345) (£141,880); city architect. Reconstruction of Capitol Cinema for Aberdeen Picture Palaces, Ltd.; A. Marshall Mackenzie, Son and George, architects.

Barking.—Development of Movers Lane Estate; borough engineer. Shops, Gibbard Cottages; T. Young & Son.

Barrow-in-Furness.—Houses (100), Roosegate Estate; borough engineer.

Biggar.—Police station and district offices (electrical work); J. Stewart, architect, 20, Albert Street, Motherwell.

Billingham-on-Tees.—R.C. elementary school (400 places); W. J. Gregory, architect, 3, Victoria Street, S.W.1.

Birkenhead.—Houses (20) and shops, Woodchurch Road, and central school, Alpha Drive; borough engineer.

Birmingham.—Cinema, Warwick Road, Olton; Whitehouse & Sons, builders, Monument Road, Edgbaston. Alterations and improvements to branch premises, Stratford Road, for Midland Bank, Ltd.; Essex & Goodman, architects, 21, Waterloo Street. Extensions to premises, Vittoria Street, for E. L. Gyde, Ltd., of 32, Frederick Street; Dallas & Lloyd, architects, 45, Newhall Street. School of printing, Frederick Street (£28,100) for the E.C.

Blackpool.—Station (£1,000,000); L.M.S. Railway Co.'s engineer, Manchester.

Bolton.—Houses (32), Longfield Road; F. Holmes. Seven shops, Chorley Old Road; A. T. Reynolds & Co.

Bury.—Rebuilding bakery department, Market Street; architects' department, C.W.S., Ltd., 1, Balloon Street, Manchester.

Cardiff.—Extensions to isolation and mental hospitals; city engineer.

Cheltenham.—Houses (34), Shelley Road; borough engineer. Development of Treelands Estate, Leckhampton Road; Mr. Hall. Telephone exchange, Prestbury; H.M. Office of Works.

Clayton-le-Moors (LANCS).—Houses (26), Oakenshaw Estate; U.D.C. surveyor.

Coventry.—Electrical installation at the New Infectious Diseases Hospital, Pinley; Dr. O. Faber, Romney House, Marsham Street, Westminster, S.W.1. Reconstruction of the Empire Theatre, Vicar Lane; W. H. Jones & Sons, builders, Lockhurst Lane.

Darlington.—Houses (122), and alterations to Arthur Pease School; E. Minors, borough engineer, Town Hall.

Dorchester.—Cinema, Trinity Street; R. A. Thomas, architect, 6, Havant Road, Cosham.

Durham.—Schools, Hurworth and Stockton-on-Tees (£92,000); F. Willey, architect, 34, Old Elvet.

Eastbourne.—Houses (54), Council Estate (£15,668); W. H. Green, Portslade. Alterations to Beaulieu Hotel, Lansdowne Terrace; F. G. Cooke, architect. Alterations to Belgrave Hotel, Lascelles Terrace; J. Bowley, architect. Alterations to Queen's Hotel, Marine Parade; G. Bainbridge & Son.

Edinburgh.—Houses (520) and shops, Restalrig, and 253 houses, Granton Mains; city architect. Rebuilding of Maximes Dance Hall and reconstruction of Grafton Café (£15,000); Reid & Forbes, architects, 17, Great Stuart Street.

Gateshead.—Houses (66), Lyndhurst Estate; E. P. Colderwood, builder, Chow Dene Estate, Low Fell.

Gillingham.—Flats, Manor Street, and houses (136), Hillyfields; borough engineer.

Greenock.—Houses (96); burgh surveyor.

Guildford.—School, Westborough; Browning & Hiscock, architects, High Street.

Hamilton.—Houses (199); burgh surveyor.

Hastings.—Mental hospital; Hastings and Eastbourne Corporations. Extensions to Regal Cinema; J. B. Mendham, architect.

Hebburn-on-Tyne.—Shops, Victoria Road, for R. Finn; J. W. Hanson & Son, architects, 18, Eldon Square, Newcastle.

Huddersfield.—Methodist Church and schools; W. A. Kellett, architect, 8, Lendal, Yorks.

Ilkeston.—Factory extension, Awsworth Road; A. Booth & Sons.

Irish Free State.—(MALLOW, Co. CORK).—Houses (36); D. J. Buckley, architect, Elmvale.

Irvine.—Re-erection of Thornhouse soap works for J. Cowan & Co. (£15,000).

Kent.—Courthouse and offices, Bromley, for C.C.; clerk, Maidstone.

Kingston-on-Thames.—School, Wood Street, for All Saints' managers; L. H. Lang, chairman.

Lanark.—Houses (48); burgh surveyor.

Leeds.—Church; Rev. P. Leonard, St. Augustine's Rectory, Harehills Road. Cinema, Montreal Avenue, Chapel Allerton; A. Cansfield. Alterations to Little Theatre, Cookridge Street; manager.

Liverpool.—Canning factory; W. P. Hartley, Ltd., Aintree. School, Goodison Road (£9,028); H. Boot & Son, builders, Moss Lane, Walton Heath. Elementary school, Highfield Estate, Broadgreen (£22,575); United Construction Co., Ltd., builders, Queen's Drive.

Lochgelly.—Houses (86), Moor Housing Estate; J. T. Scobie, architect, 1, Douglas Street, Dunfermline.

London.—(CATFORD).—Houses, Ravensbourne Park; Highfield Estates (Ravensbourne Park), Ltd. Shops, corner Hither Green Lane and St. Mildred's Road; A. Frampton. (FINCHLEY).—Houses (154) and shops (22), Halliwick Manor Estate; Halliwick Estate Co. Preparatory school, Kingsley Way; Capt. D. Marjoribanks. (FULHAM).—Additions, 417-429, North End Road; H. A. Sexton & Son, 42, High Road, Kilburn, N.W. Additions, Whiffen's Chemical Works, Carnwath Road; Holland & Hannen. (HAMPSTEAD).—Seven shops and flats (14), Falloden Way; Kentish & Sons (LEWISHAM).—Catholic school, Moorside Road. Downham; J. Tolhurst. Additions to St. Saviour's Catholic Schools, High Street; L. H. Shallock. (TOTTENHAM).—School (300 places), White Hart Estate; Catholic trustees. (WANDSWORTH).—Further development of Magdalen Park Estate; Murrell & Pigott.

Lye.—Electrical installation at 100 houses, Hodge Hill Farm Estate; H. E. Folkes, U.D.C. architect.

Manchester.—Alterations to premises, Stevenson Square, for Patons & Baldwins, Ltd. (electric lighting installation); W. Kennedy, architect, St. Peter's Square. School, Benchill (£24,000), extension of Tame Street Institution, and remodelling of Victoria Hotel (£5,000); city architect.

Morecambe.—Alterations, Carlton Restaurant, Marine Road; J. Fletcher.

Motherwell.—Fourteen blocks of flats of four houses each (£22,400); Scott & Co., Ltd., builders, 116, Hanover Street, Edinburgh.

Newcastle (STAFFS).—School, Westlands Estate; director of education.

Newcastle-on-Tyne.—Extensions to Eye Hospital (£10,000); Newcombe & Newcombe, architects, 23, Elden Square.

Northwich.—Electrification of Weston Point Dock (£6,000), for Weaver Navigation Trustees.

Nottingham.—Extensions to Aston Hall, Aston-on-Trent (£50,000), for Mental Deficiency Department; city surveyor, Guildhall.

Oldham.—Children's hospital; borough surveyor.

Perth.—Extensions to offices for the General Accident Fire and Life Assurance Corporation; N. Miller, manager.

Plymouth.—Houses (205), and flats, Barne Barton Estate (£75,595); Building & Public Works Construction Co., Ltd. Development of North Houndiscombe Estate; North Houndiscombe Estate Co. Alterations and additions, Victoria Road, St. Budeaux; Co-operative Society.

Riccarton (AYRSHIRE).—Creamery for Scottish Co-operative Wholesale Society (£28,000); manager, Glasgow.

Richmond (SURREY).—Houses (250), Petersham, for Park Estates, Ltd.; Partridge & Daniel, architects. Shops, for the Southern Railway Co., Ltd.

Rotherham.—Church, Clifton; Rev. Canon H. D. Morgan.

Shafford (SURREY).—Estate development, Clifford Manor Road; Godwin Austin Estates. Estate development, Tillingbourne Road; Armstrong & Co., builders, Cobham.

Shipley.—Houses (54), St. John Street; Dale & Wild.

Smethwick.—Eight shops and houses, Hurst Road; E. Turner.

Southall.—Conversion of "Chestnuts," The Green, to hospital; Bostock & Hollins.

Southgate.—Public baths, &c., Powys Lane; U.D.C. surveyor.

Southport.—Houses (104), Guildford Road site; Baker & Foster, builders.

Stannington.—Extensions, Mental Hospital (£120,000) for the Gateshead, South Shields, and West Hartlepools Corporations.

Stockton-on-Tees.—Estate development, Newlands Avenue, Norton; M. C. Robson, architect, 144a, Newgate Street, Bishop Auckland.

Stone (STAFFS).—Houses (236), Fillybrook Estate, for the Commercial Estate Co.

Stratford-on-Avon.—Conference hall (450 seats) for governors of the Memorial Theatre (£8,000); Scott, Chesterton & Shepherd, architects, Holly Studio Mount, N.W.3.

Todmorden.—School, Walsdon, for E.C.

Twickenham.—Houses (118); borough surveyor.

Waddon.—Development, Waddon Court Estate; H. G. Palmer.

Wakefield.—Greyhound and sports stadium, Denby Dale Lane; J. P. Firth. Mill extensions, Alverthorpe Road, for A. Haley & Co., Ltd.; Newbald & Hartley.

Wells.—Alterations, Town Hall; Carol & Passmore, Westminster, S.W.1.

Whetstone.—Three shops, High Road; J. Sainsbury, Ltd.

Wilton (WILTS).—Senior school, for the C.O.E. managers; correspondent.

Wiltshire.—Extensions, including laundry and power house (£17,550), for C.C.; E. S. Hoare, engineer, 39, Broad Street, Bristol.

Wimbledon.—Flats (34), Bathgate Road and Somerset Road; G. W. Ferrier.

Worthing.—Flats (52), South Farm Road; H. Osborn. Additions, Green Gates Hotel, Lansdowne Road; J. E. Lund.

York.—Estate development, School Lane, Copmanthorpe; S. C. Nekervis. Greyhound tracks; Ramsbottom & Sons, Ltd., and Agrian Sydney & Partners.

Power Farming

A new departure in agricultural education will be a special course of lectures on the use of machinery and labour-saving equipment, which the Harper Adams Agricultural College is arranging to hold from January 2nd to 7th. The programme has been framed to bring together leading exponents of the various modern systems of farming, and will include such papers as one on "Mechanised Cereal Growing," by Messrs. Alley Bros., and another on "Open Air Dairying," by Mr. A. J. Hosier; while Mr. D. R. Bomford will discuss the equipment for mixed farming, market gardening, and fruit growing. Mr. D. N. McHardy, of the College Engineering Department, will deal with "The Tractor in Service." In addition, technical aspects of the internal combustion engine, including the Diesel type, and electricity in their agricultural applications, will also receive attention. The lectures will be supported by practical demonstrations. Accommodation will be provided in the College during the course. Full particulars are obtainable on application to the principal of the college, Newport, Shropshire.